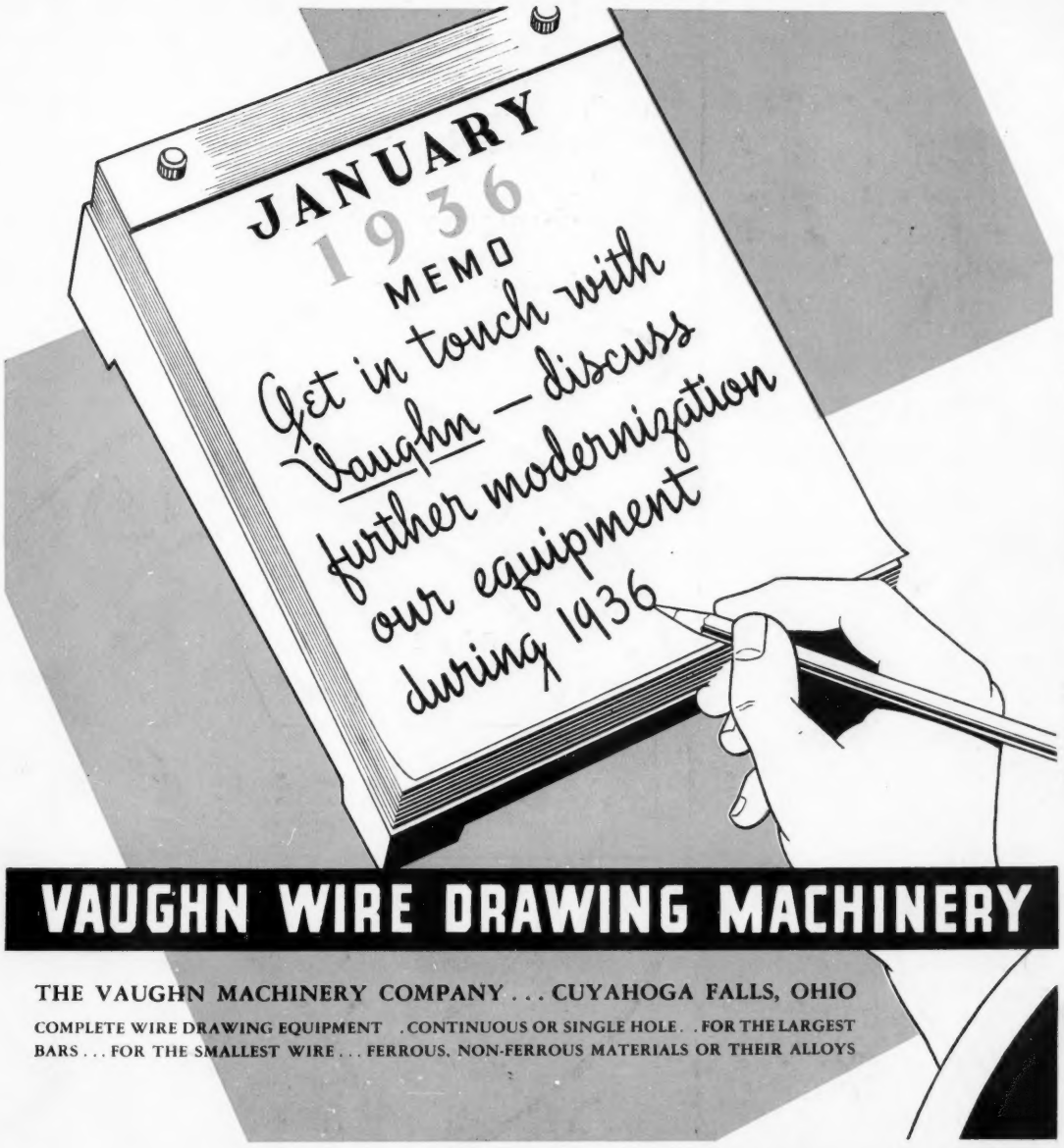
WIRE AND WIRE PRODUCTS

JANUARY 1936



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OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

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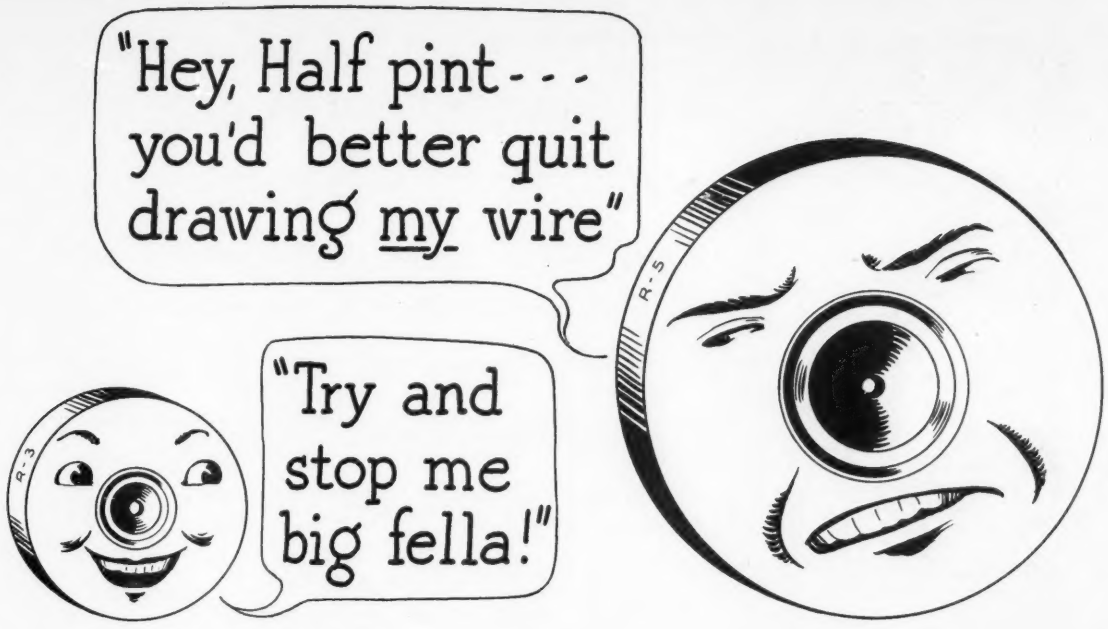

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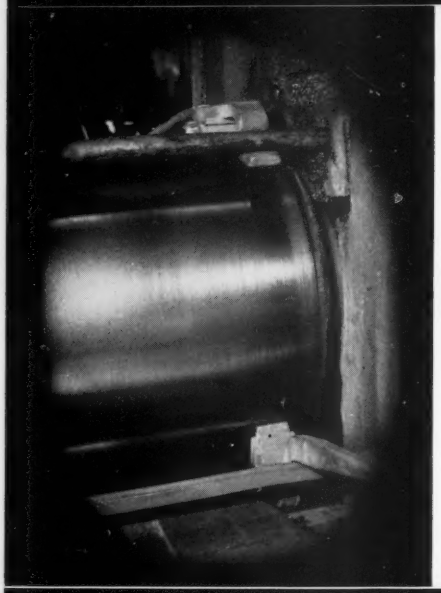
ROLL SCOURING BRICKS



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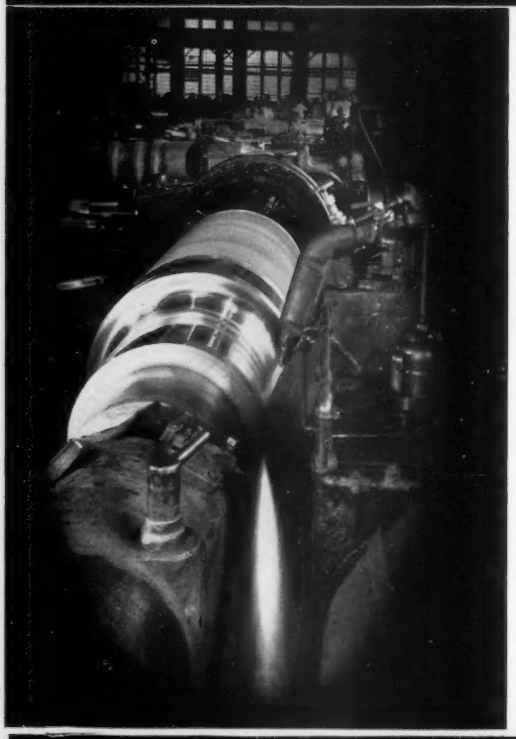

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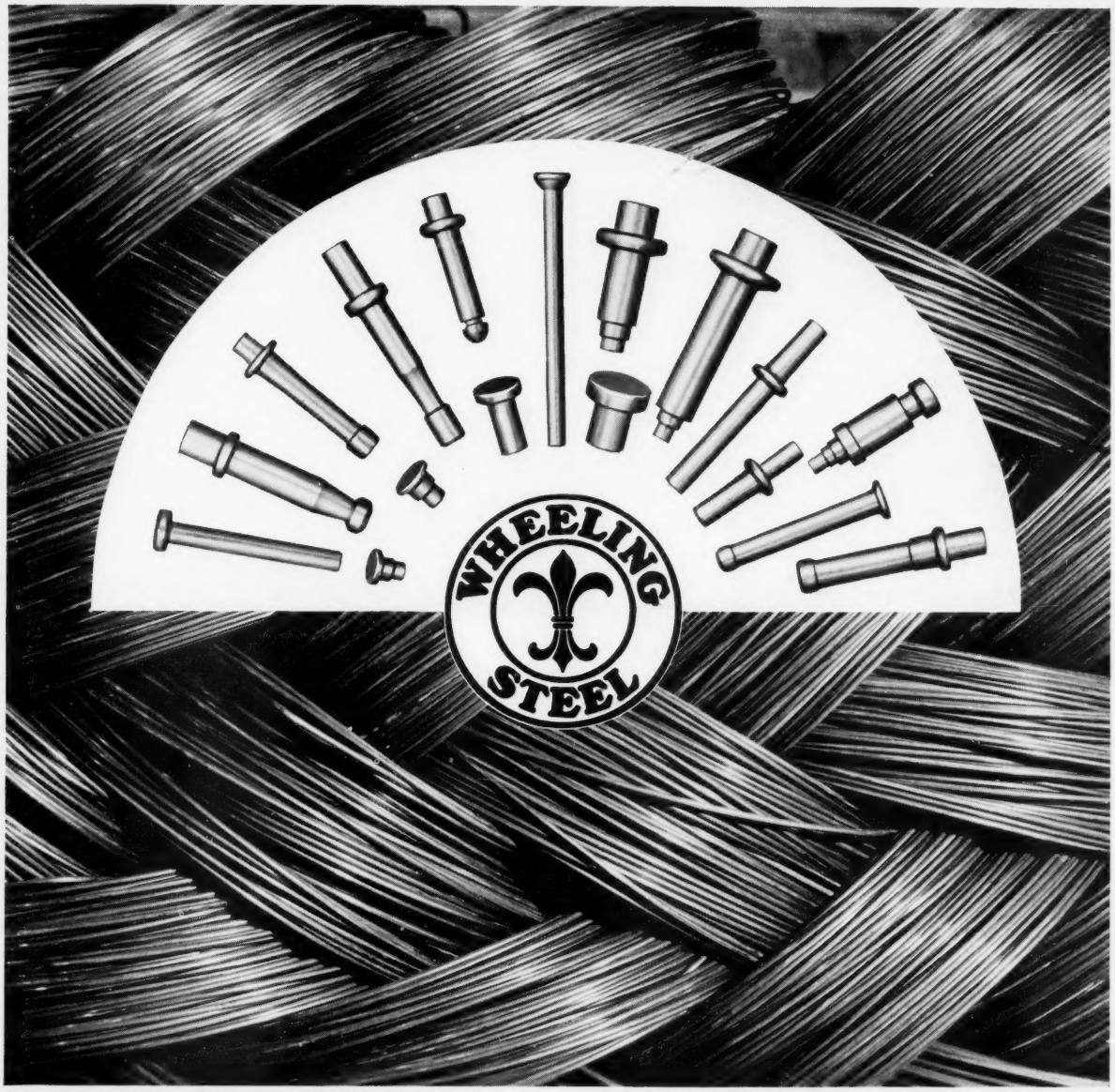

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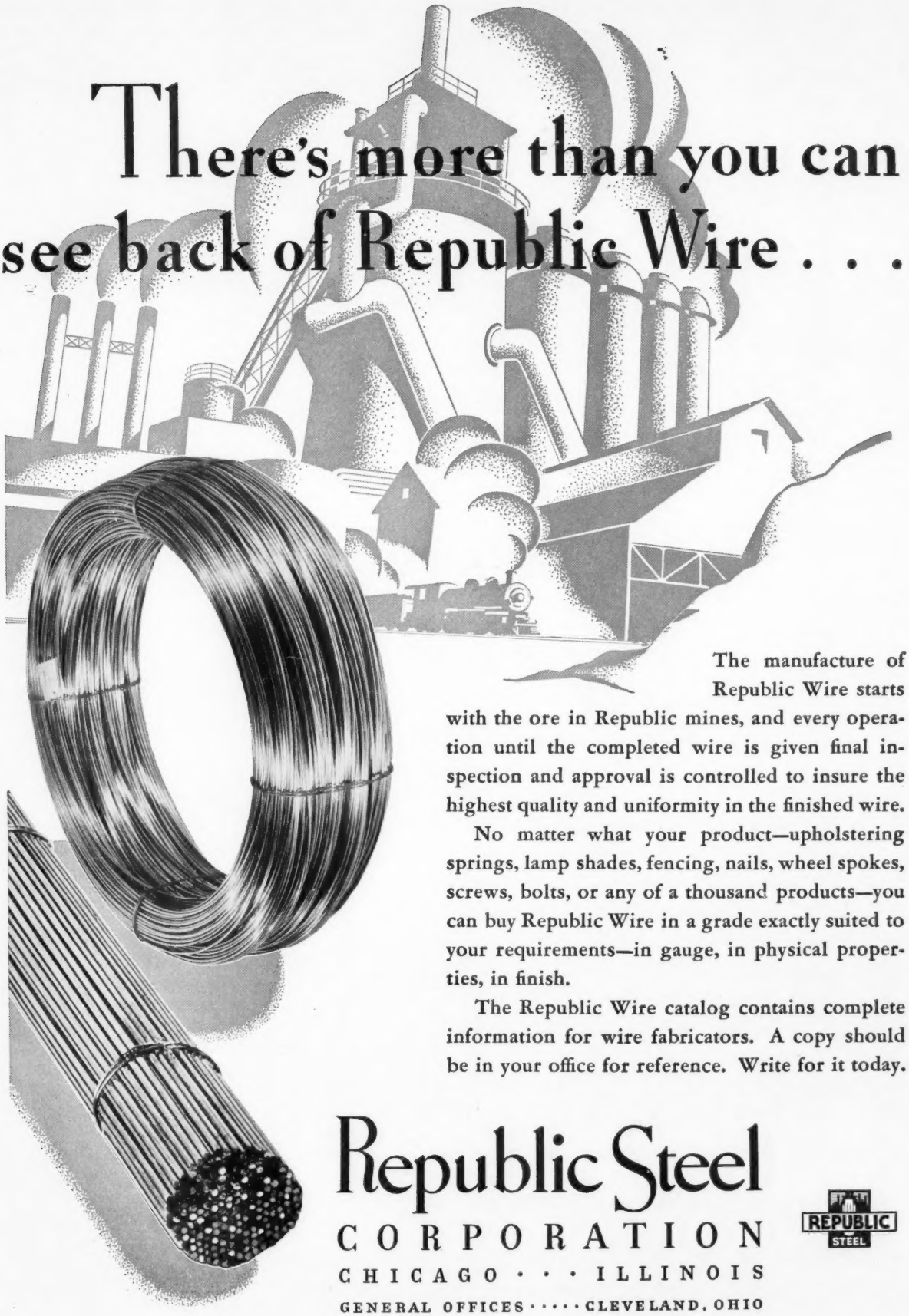

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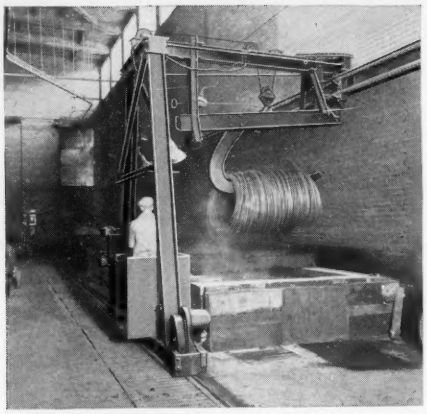

Ten mills have installed
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  because of Savings effected and Efficiency proven by years of Service in all industries and under all kinds of operating requirements.
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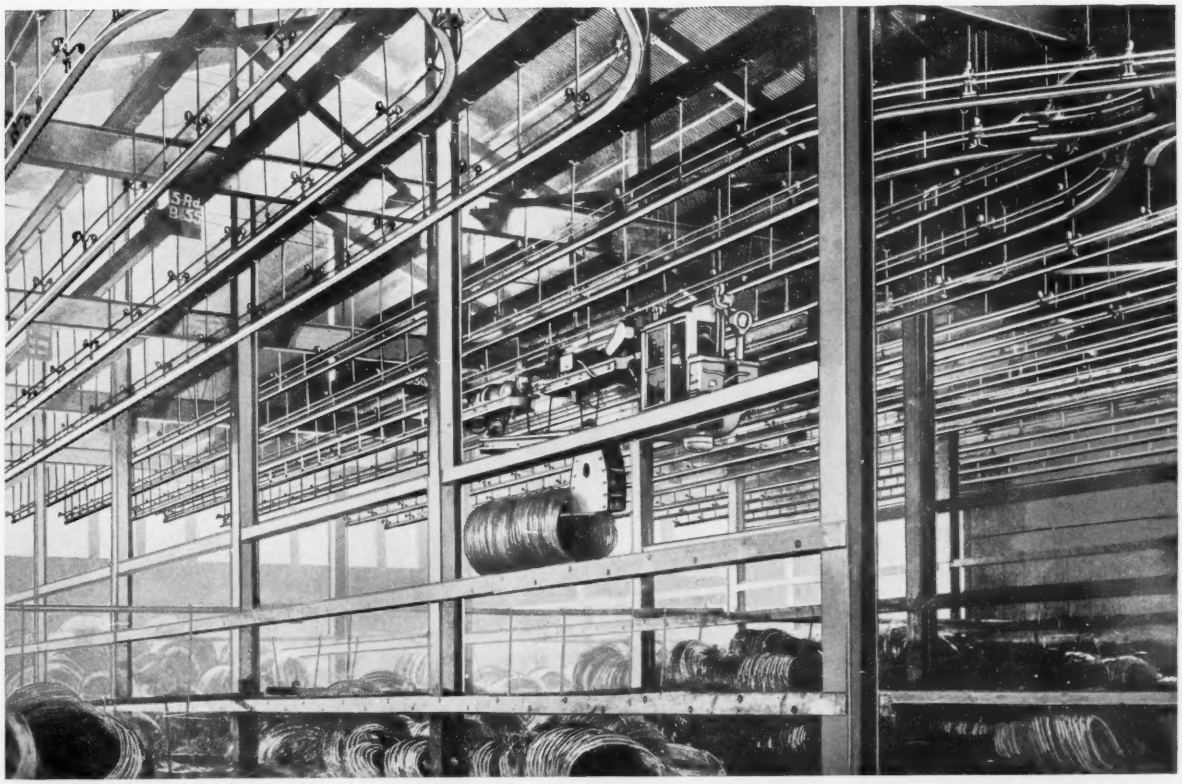

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2 for .050
3 for .025

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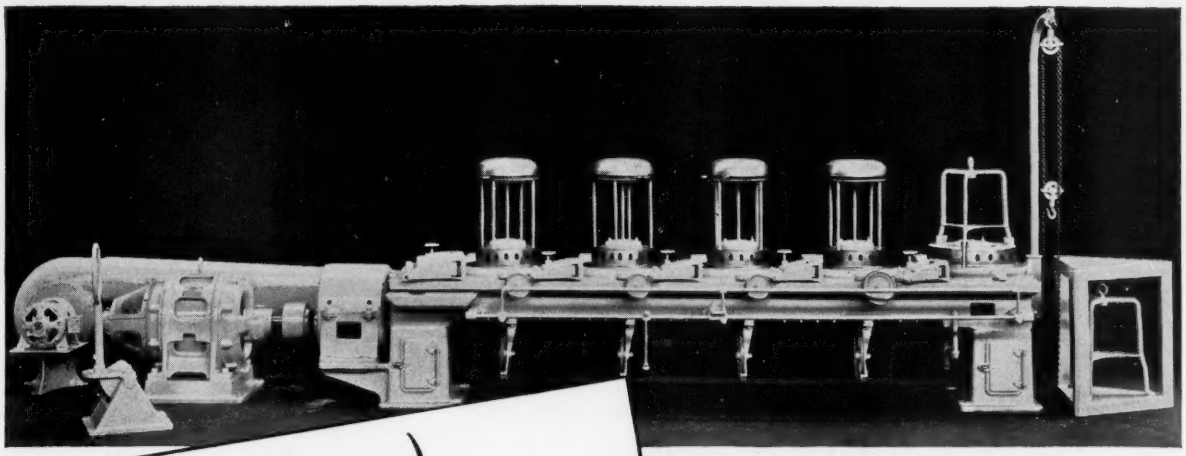
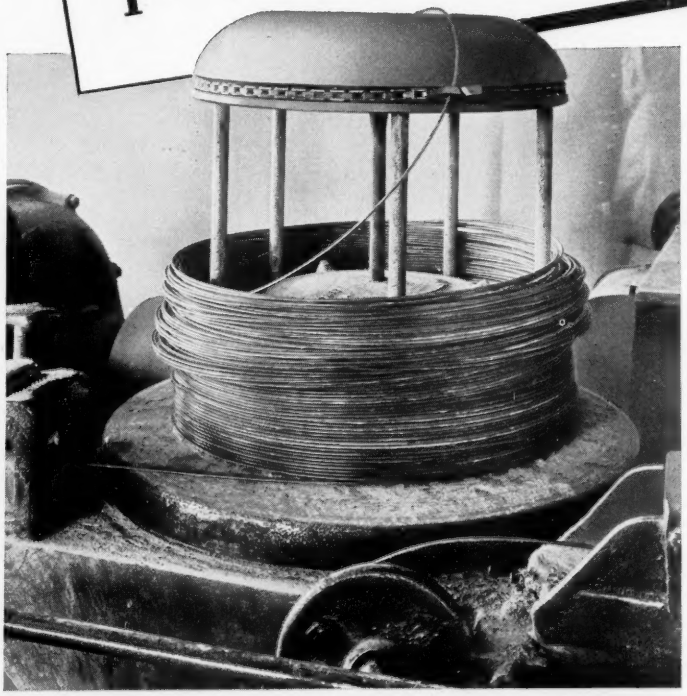


How (long) fast is a piece of wire?



At top: Morgan-Connor Continuous Wire Machine, Type B: start No. 5 rod, high carbon steel; five blocks. Fully equipped with motor and control, air-cooling system, clutches, safety stop, motor-driven pointer, grip and stripping equipment.

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May we be of service to you in the coming year?

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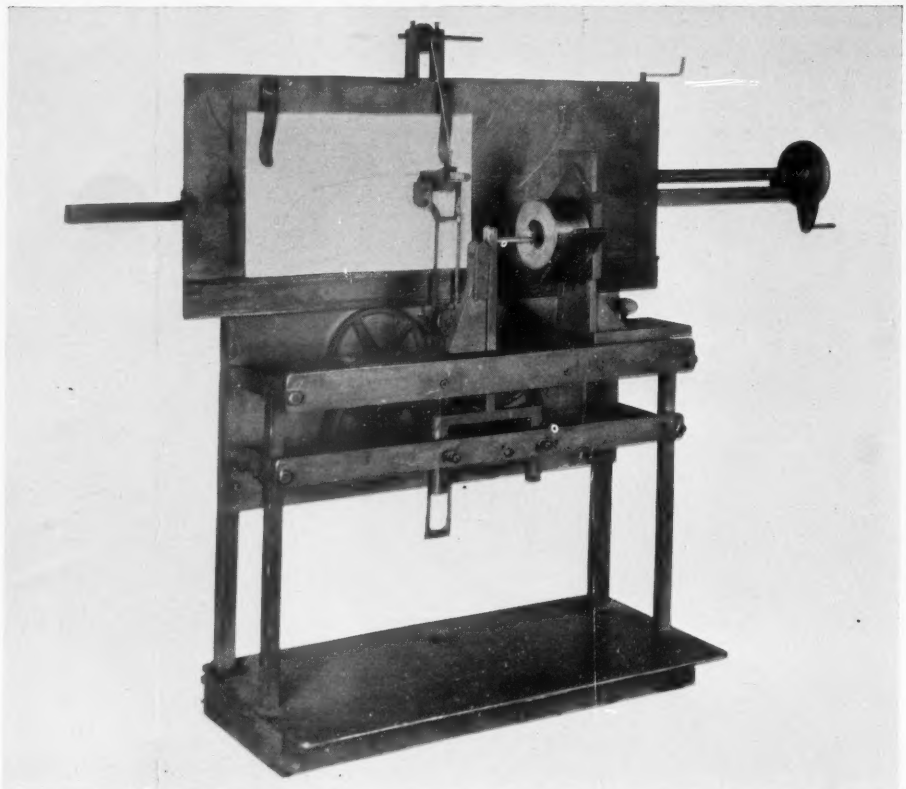

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip Wire Products and Insulated Wire and Cable

DRAWING—ROLLING—EXTRUDING—FORMING—FABRICATING

Vol. II January 1936 No. 1

Designated as

Official Publication By The Wire Association

Contents

Requirements of Materials for Weaving Fourdrinier Wires . . . . . by Hugh E. Brown 15

The outline of the properties required in wires to make them suitable for the manufacture of fourdrinier and cylinder face wire cloth. The latest annealing methods are described and photomicrographs are shown to illustrate the grain structure of the metal characteristic of various degrees of annealing.

The Problem of Retirement of Wire Rope from Service . . . . . by B. M. Suslov 19

A means for intelligently determining the life of wire rope. An outline of Russian practice in this connection.

Progress in Engineering Knowledge During 1935 . . . . . by P. L. Alger 22

Cellulose Acetate Treatment of Textile Insulation . . . . . by E. B. Wood 25

The advantages of cellulose acetate treatment of textile insulation outlined together with methods of application.

A New Type of Insulating Machine . . by Austin Casey 29

The introduction of new types of insulations, such as Cellophane, cellulose acetate and fine papers have created a fast growing demand for precision in wire insulating machinery. This article describes a recent development.

Outstanding Personalities of the Wire Industry 31

Imports and Exports of Wire 32-33

A Review of Recent Wire Patents 34

'Round the World With the Wire Industry 35-36-37

British Institute of Metals—Digest of Papers 40

Cable Developments in 1935 . . . . by John Liston 47

Index to Advertisers 54

Buyer's Guide 55-56

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A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING--- EXTRUDING --- FORMING --- FABRICATING

Vol. II JANUARY 1936 No. 1

Requirements of Materials for Weaving Fourdrinier Wires*

By Hugh E. Brown, Director of Research,
W. S. Tyler Company, Cleveland O.

Abstract

The outline of the properties required in wires to make them suitable for the manufacture of fourdrinier and cylinder face wire cloth. The latest annealing methods are described and photomicrographs are shown to illustrate the grain structure of the metal characteristic of various degrees of annealing. ✦ ✦

THE making of wire cloth and screens is a specialty business which calls for a careful analysis of all conditions before the proper selection of metal, mesh, and wire diameter can be made. Naturally, each class of work has its own requirements and the manufacturer is called upon to combat all sorts of destructive forces including chemical attack, severe abrasion, vibration and many others that necessitate the use of all that is available in metals and in physical properties.

✦ ✦ ✦

THE paper industry, however, presents to the wire cloth manufacturer a most interesting phase of mechanical and metallurgical development. Its demands are exacting and the problems presented are often difficult due to the nature of the work that the wire cloth must perform in the making of paper. Fourdrinier wires, cylinder facings, and other wire cloth applications in this field make up an attractive part of the screen business and of the eight thousand specifications of wire cloth used in all industries, the fourdrinier represents the most difficult problem. Its function as a dewatering medium calls for a very high percentage of air space or drainage area, and this places certain definite limitations on its constitution. The wire cannot be designed from the standpoint of strength alone but it must be almost too delicate for the hard service that it receives.

✦ ✦ ✦

IN the weaving of the fourdrinier wire there are certain factors to be met which must also be judged from the standpoint of service. After all these influences are brought together and checked against the metals at our disposal it is found that the list of suitable materials is a very small and select group, in fact these could be counted on the fingers of one hand.

✦ ✦ ✦

Metallurgical Considerations

THIS is a great age, however, metallurgy is going forward by leaps and bounds, new alloys, better processes, and wider understanding are certain to produce more and better materials from which the fourdrinier wire can be made. In this connection it is interesting to note the great amount of research being done on the so called stainless steels. So far these chromium-iron alloys have had their shortcomings in so far as the fourdrinier wire is concerned although they are rapidly finding their way into the cylinder faces and into chemical industries. High-nickel alloys are receiving considerable attention too and they may present interesting and useful materials later. So we may hope for a wider range in the near future and for the present there is considerable that can be done in improving our processes so as to make even better metals from the few suitable materials now being used. Experiments are dangerous and costly and we all know of some very disastrous experiences brought about by attempting to use improper alloys for this exacting work.

✦ ✦ ✦

*A paper presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, New York, N. Y. Published by permission of the Paper Trade Journal. ✦ ✦ ✦

Designated as Official Publication by the Wire Association

IN weaving fourdrinier wires there are many factors of importance which must be fully recognized and dealt with if the wire is to give a satisfactory run:

1. The tensile strength of the warp wires must be sufficient to stand the tension caused by the load and the drive.

2. The ductility of the wire is important as it must be able to stand the bending caused by running over rolls at high speed, but this property must be under control as too much ductility would result in excessive stretching of the wire.

3. It must have resistance to fatigue, or ability to withstand the bending under tension, that is, it must be able to withstand cold working without hardening too rapidly.

4. The abrasion resistance must be sufficient to offset the wearing influences met with due to suction box wear, abrasive fillers, etc.

5. Resistance to corrosion is usually important and in some cases this influence becomes very acute.

✦ ✦ ✦

THE problem then is to find the metal, or metals, which have the above characteristics, and to develop these in the proper balance during the wire drawing operations. This involves correct scheduling of drawing and annealing so as to build up the resistance to the destructive forces mentioned. The wire drawing has undergone some splendid development in the last few years due to the improvement of machinery, lubricants, and dies, all of which produce better wire as it can be held more closely to the exact size and is not so subject to imperfections such as scratches, roughened surface, or being "out of round". These imperfections are very troublesome during the weaving process and their successful elimination goes a long way toward making better fourdrinier wires. With smooth, truly sized wire and correct annealing procedure the weaving is accomplished with minimum delay and a most satisfactory product results.

✦ ✦ ✦

Wire Annealing

ANNEALING is receiving its full share of development these days and its problems are becoming less difficult mainly because of the use of controlled temperatures and controlled atmospheres. The smooth die finish of the wire surface is unharmed by destructive cleaning or pickling solutions as the metal is kept bright and clean throughout the process. The most outstanding equipment of this type is the so-called strand annealer where the individual strands of wire are run through separate tubes which are filled with a suitable gas atmosphere and the equipment so arranged that the wire is heated to the proper temperature and cooled during its travel through the tube. This equipment has some very distinct advantages as it is flexible in its operation, and once set, will continue to produce wire of the same

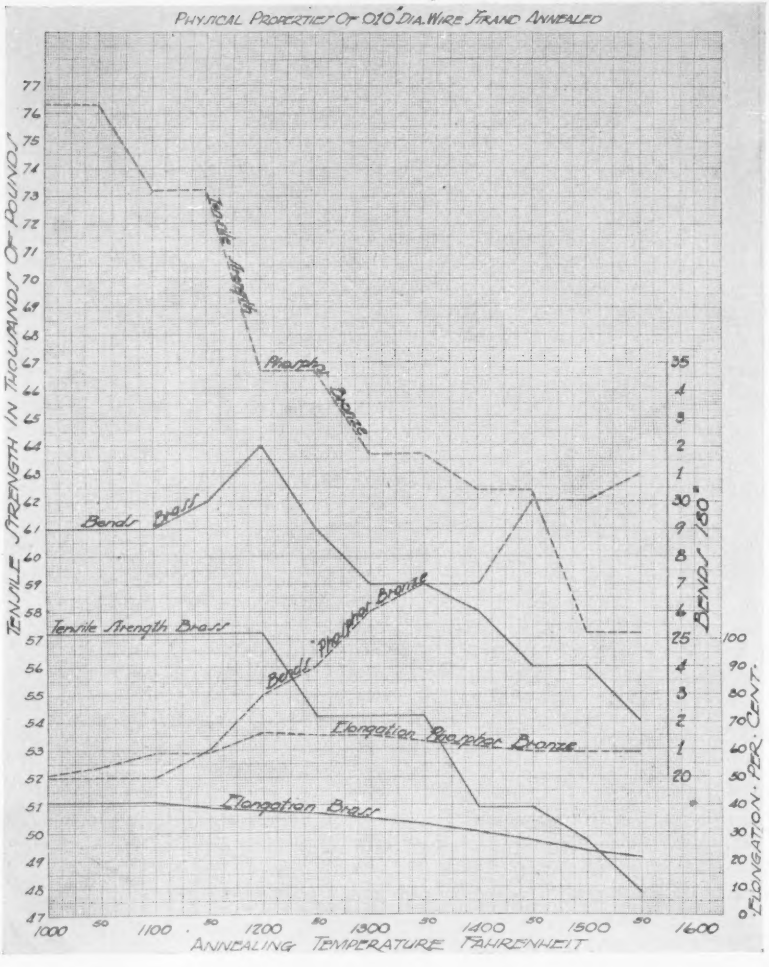

Fig. 1. Physical properties .010 inch diameter wire strand annealed. ✦ ✦ ✦

TABLE I
PHYSICAL PROPERTIES OF .010" DIA. WIRE STRAND ANNEALED

	Brass				Phosphor Bronze		
Annealing temp.	Tensile strength lbs./ sq. in.	Elongation per cent	Bends	Annealing temp.	Tensile strength lbs./ sq. in.	Elongation per cent	Bends
1000	57,200	41	29	1000	76,300	51	20
1050	57,200	41	29	1050	76,300	54	20
1100	57,200	41	29	1100	73,200	59	20
1150	57,200	39	30	1150	73,200	59	21
1200	57,200	38	32	1200	66,700	66	23
1250	54,200	37	29	1250	66,700	65	24
1300	54,200	35	27	1300	63,700	65	26
1350	54,200	33	27	1350	63,700	63	27
1400	50,900	30	26	1400	62,400	61	27
1450	50,900	27	24	1450	62,400	59	30
1500	49,700	23	24	1500	57,200	59	30
1550	47,800	21	22	1550	57,200	59	31

temper and characteristics hour after hour, providing, of course, that the chemical analysis of the metal and previous steps in the process have not undergone any change.

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TABLE I shows the physical properties developed in brass and phosphor bronze in an .010 inch diameter wire when run through the strand annealing equipment keeping the speed constant but changing the temperature in 50 degree steps through a range of from 1000 to 1550 deg. F. This represents the useful range in these metals in so far as the weaving of fourdrinier wires and cylinder facings is concerned.

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FIG. 1 shows the graphical representation of the physical properties of these wires. All of the graphs are referred to the bottom scale for temperature and other scales as indicated. This data is shown merely to illustrate the control which can be obtained with this annealing process. With the help of information obtained through service data it is possible to correlate information which is helpful in making calculations so as to meet specific conditions of operation.

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THE difficulty in arriving at these conclusions has always been that of properly interpreting the figures obtained from tests on worn out fourdrinier or cylinder facings. Obviously, tensile tests, elongation determinations, or even bending tests run on used wire cloth are apt to be more misleading than they are helpful. At least, they would not be comparable with those run on the strands of wire from which the cloth was originally made. In this connection the miscroscope is a very valuable instrument as there is a relationship between the physical properties of the wire and its grain size. For instance, a metal of constant chemical analysis taken in the hard drawn state and annealed at various temperatures will show a larger grain size after each increase in temperature. The information obtained through this means cannot be taken too seriously as after all it is only a relative result but it does provide a means of at least approximately determining the physical properties of the metal in a wire that has been crimped and woven or handled in such a way that for mechanical reasons the physical properties on it cannot be obtained in the usual manner.

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Photomicrographic Examination

FIG. 2 shows the grain structure of the .010 inch diameter brass wire, the properties of which were plotted and tabulated in Fig. 1. The graduation of grain size through changing annealing tem-

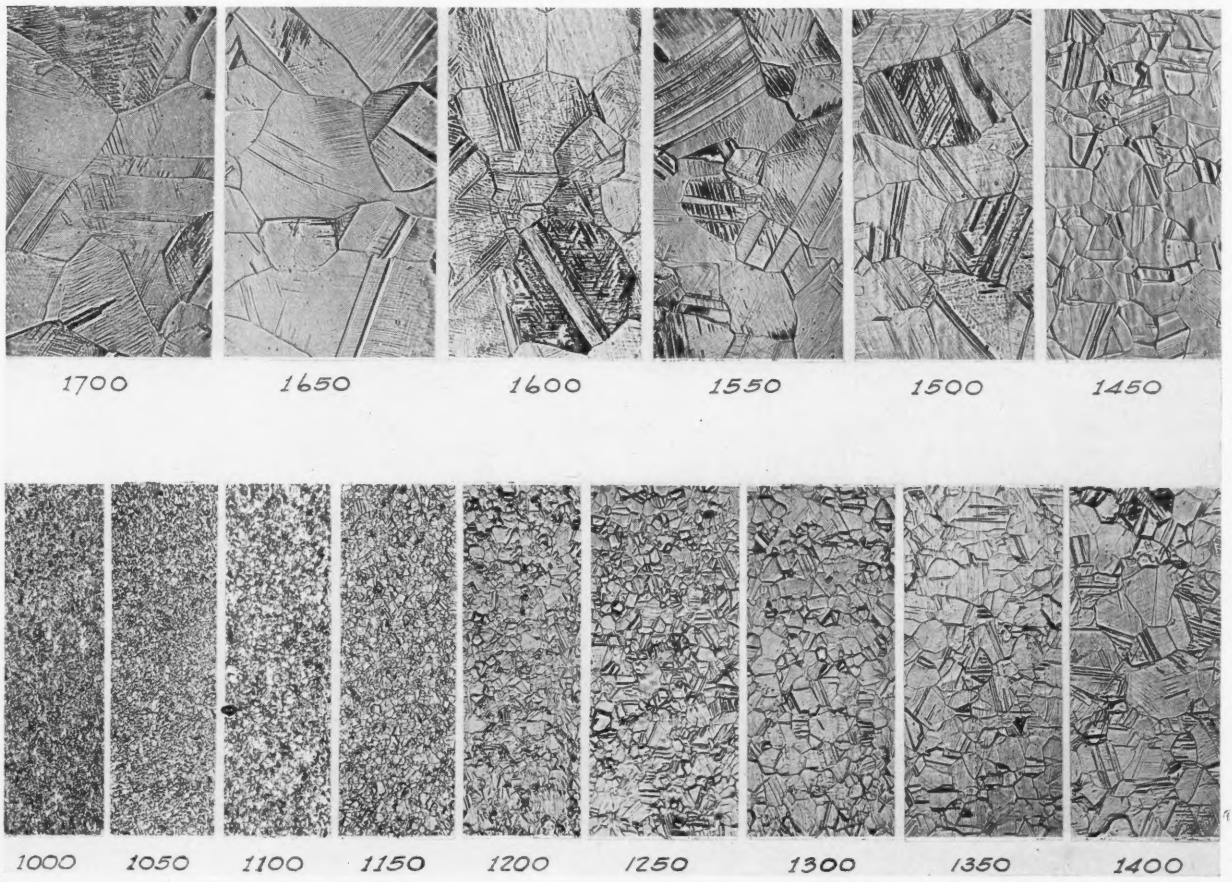

Fig. 2. .010 inch diameter brass wire strand annealed.

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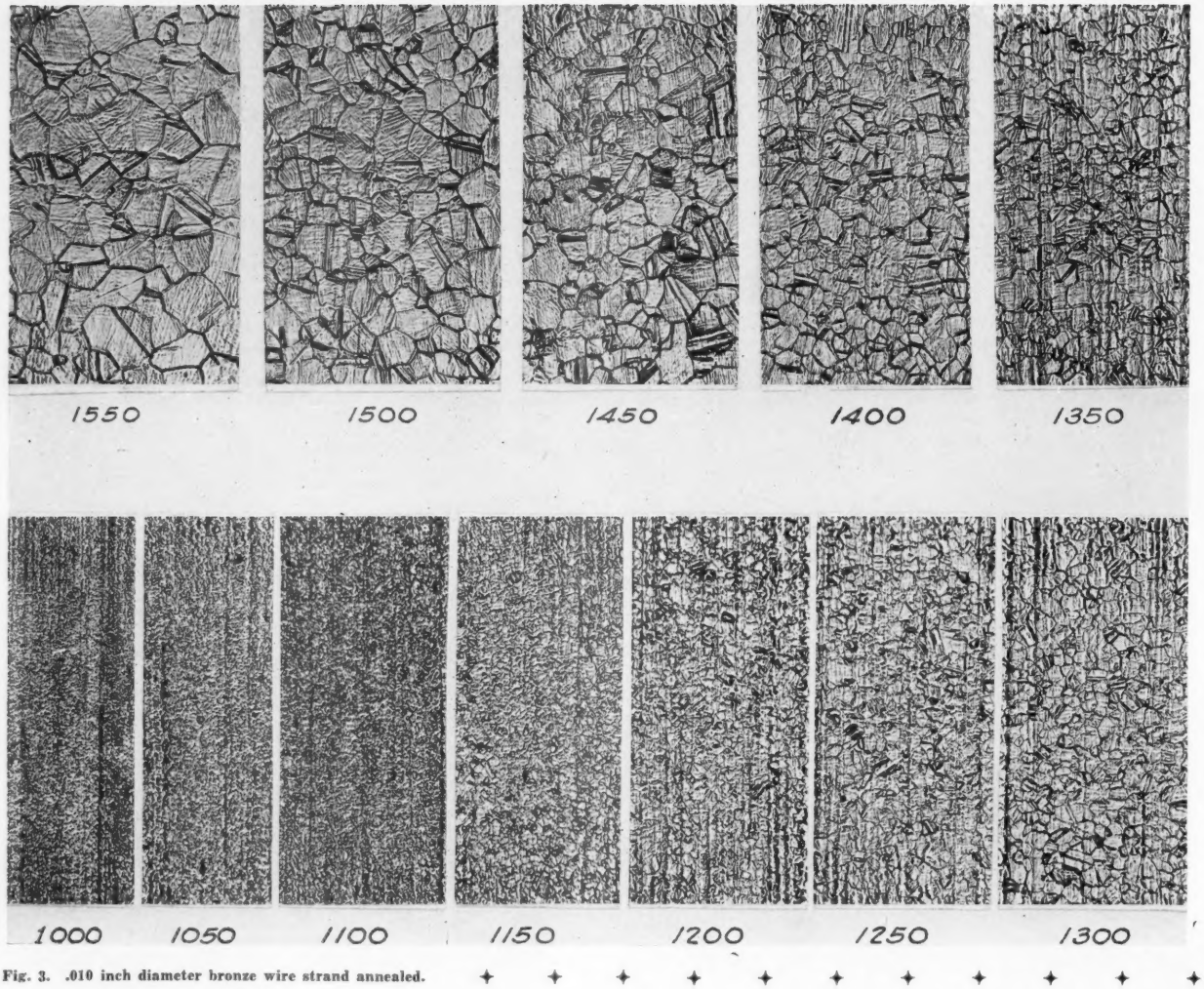

Fig. 3. .010 inch diameter bronze wire strand annealed.

peratures is brought out by this illustration. Assuming that the chemical analysis of this metal is known and the relationship between its grain size and physical properties has been established, the microscope can then be used to determine approximately the physical properties of the metal even in a wornout piece of screen or fourdrinier wire. The sample necessary for reading these results can be extremely minute as it is possible to read the characteristics of the metal as shown by examining the top of one knuckle of the wire.

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FIG. 3 is similar to Fig. 2 but represents the grain formation of the .010 inch diameter phosphor-bronze wire when annealed in

(*Please turn to page 54*)

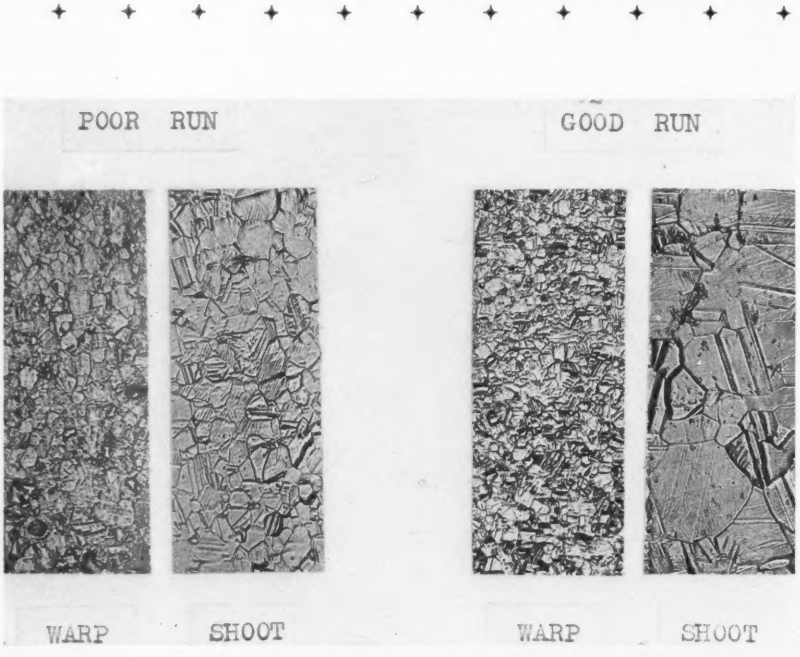

Fig. 4. Fourdrinier wires.

The Problem of Retirement of Wire Rope From Service

By B. M. SUSLOV
Metallurgical Engineer, U. S. S. R.

A means for intelligently determining the life of wire rope. An outline of Russian practice in this connection.

THE problem of determining the proper time to replace a wire rope in service is one that has commanded much thought and consideration among wire rope consumers. One of the most important problems in wire rope practice is the fixing of the limits for the life of wire rope; that is, the determination of that moment when it becomes dangerous to use the same rope on account of its being worn out and facing the possibility of sudden rupture. In many cases the failure of a rope in service not only endangers human life, but also involves a large cost and loss of time.

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ON the other hand, when ropes are continually retired from service prematurely due to the lack of a method for determining reserve strength, the initial cost of ropes and time spent in replacement becomes excessive.

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THIS problem has not been solved as yet owing to the lack of necessary data, and therefore ropes are often being replaced when it is either too late and they are under the danger of rupture, or too early from economical point of view.

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THAT this problem is no simple one is clearly demonstrated by the fact that no successful or fool-proof method, has been established even after all the attention paid to it. The question then resolves itself into determining some means for intelligently appraising a worn rope.

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THE most practical suggested test method to clear this question up would be to determine the life of the wire ropes in proportion to the degree of wear or deterioration of the ropes, that can be shown by the number of broken wires on the certain length of the rope compared with (or referred to) each 100 wires constituting the section of the given rope.

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IT might be possible to take for a standard a certain definite degree of the allowable deterioration (wear) of the rope and thus to determine the life of the ropes. Although this method is sometimes applied in the practice of application of wire ropes, and may be regarded as correct in principle, yet it is necessary to take into consideration the construction and the nature of the different ropes. It is impossible to fix the same degree of deterioration of a sample rope for all the ropes.

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SOME research made by **Prof. R. Woernle** in Germany for the compiling of data necessary for the solution of this problem, is of extreme value and gives definite indications in this respect.

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IT appears that the same degree of deterioration of the differently constructed wire ropes used under the same conditions, decreases their breaking strength differently.

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THE breaking strength of the wire rope diminishes in proportion with the increased degree of deterioration of the rope only to a certain exent, after which it drops suddenly to 10%-30% of the

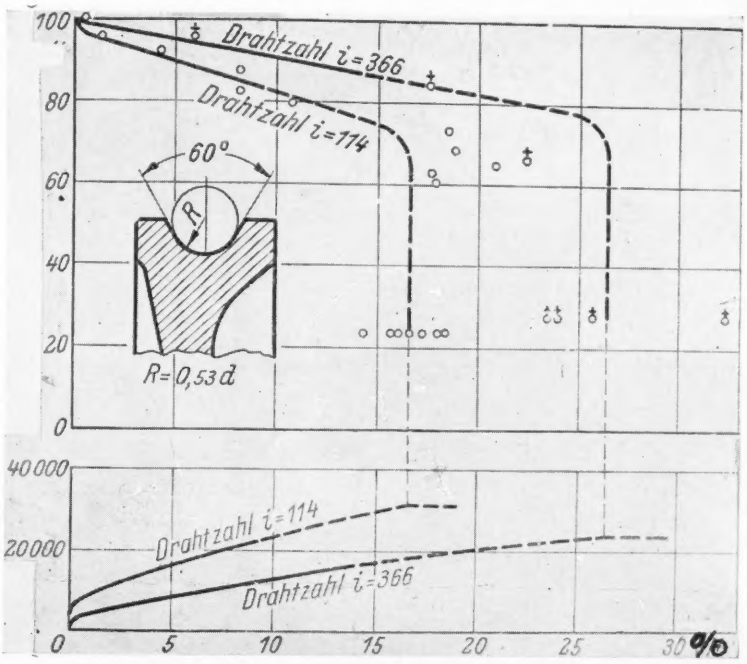

Fig. 1 (upper). Relation between the decrease in reserve (remaining) strength of regular lay ropes of different number of wires shown in % from initial ultimate strength and the degree of the deterioration of these ropes.

(Lower). The degree (process) of deterioration of regular lay ropes in relation to the number of bends over sheaves. The number of broken wires within a length of one rope lay on each hundred of wires in the section of rope means the degree of deterioration of a rope in %.

initial ultimate strength. This exhaustion of breaking strength occurs in wire ropes of different constructions at different degrees of deterioration.

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THE three following diagrams show the results of the research made by **Prof. R. Woernle.** The wire ropes were tested as an endless chain traveling over the sheaves of the diameter of 400 mm. (16 in.) under the specific load with a tension—30 kg/mm². The bend of the ropes was effected in one direction.

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THE ropes having reached the certain degree of deterioration were tested for their breaking strength with a view of determining the reserve strength of the rope in per cent from initial ultimate strength and number of bends effected during the ropes run over the sheaves.

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ON Fig. 1 the two **Regular Lay** wire ropes of same metal section and made of the wire of the same tensile strength = 130 kg/mm² were submitted to a test: one rope of ordinary construction: 6. (1+6+12) + 1 Hemp core of —114 wires of the same diameter. The second rope of ordinary construction: 6(1+6+12+18+24) + 1 Hemp core of —366 wires of the same diameter —0.56 mm.

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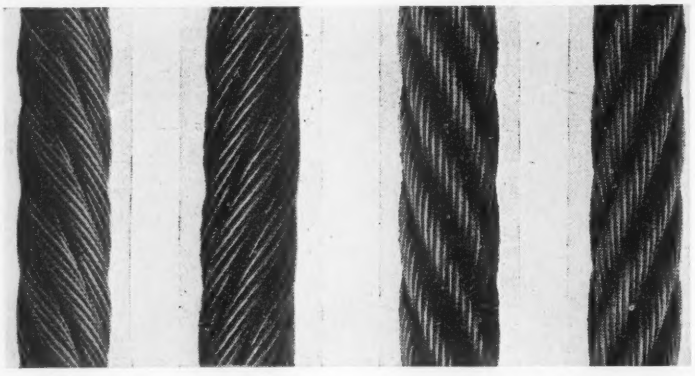
ON Figs. 1, 4 and 5 the degree of the deterioration of the rope is shown by the number of broken wires within a length of one rope lay in per cent of the total wires in the section of rope. (By rope lay is meant that length of rope in which a strand makes one complete revolution about the rope axis). The upper surves (see Fig. 1) show the decrease in the reserve strength (in %) of **regular lay** ropes of the different number of wires in relation to the degree of deterioration of rope. The

Fig. 2. Types of wire ropes lay. Regular-lay rope. Lang-lay rope.



a. Right-lay. b. Left-lay. c. Right-lay. d. Left-lay.

reserve strength is shown in % from initial ultimate strength of ropes. The lower curves (Fig. 1) show the increase in the degree of wire rope deterioration in relation to the number of rope bends around sheaves, that is the process of deterioration of ropes.

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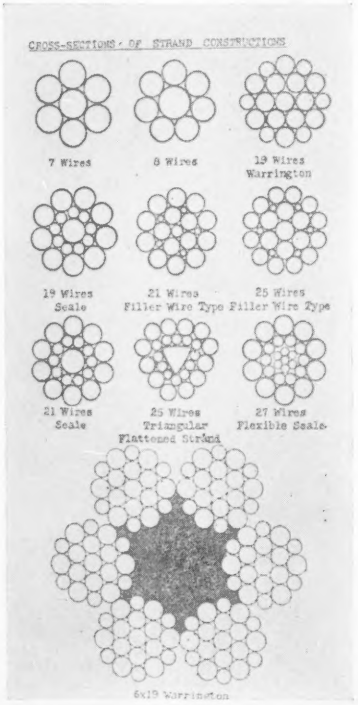
FROM Fig. 1 is to be seen that the **Regular Lay** rope of —114 wires has the greater durability (endurance) under the bends; that is greater resistance to bending fatigue, than the rope of —366 wires, but the decrease of the reserve (remaining) strength under the same degree of deterioration is more noticeable on the rope of —114 wires, and the exhaustion of its reserve strength comes under the lower degree of deterioration (17%) than the rope of —366 wires (27%).



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Types of Wire Rope Used In Industry

FINISHED wire rope is made in two types of lay — that is **regular lay** and **Lang lay.** In **regular lay** rope the direction of lay of the wires in the strands is opposite to the direction of lay of the rope. In **Lang-lay** rope the direction of the lay of the wires in the strand is in the same direction as the lay of the rope.

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IN right-hand lay the wires or strands pass from left to right across the top of strand or rope while receding from the observer. In left-hand lay the wires or strands pass from right to left across the top of the strand or rope while receding from the observer. In the **regular lay** rope the axes of the outer wires on the crowns of the strands run parallel to the rope axis. In the **Lang-lay** rope the axis of outer wires on the crowns of the strands lay at an angle with respect to the rope axis.

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A WIRE rope consists of six or eight strands twisted helically around a hemp or wire core with a uniform length of lay.

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A STRAND consists of concentric interlocking layers of wires twisted helically around a steel wire or hemp core with uniform length of lay.

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STRAND fabrication for wire ropes may be of either ordinary. Warrington, Seale or Filler wire construction.

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"ORDINARY" construction is to be made in one operation, consisting of 6 strand of 7, 19, 37

or 61 wires to the strand. All the wires are to be of the same diameter.

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"WARRINGTON" construction is to be made in one operation, consisting of 6 strands of 19 wires to the strand. The outside of each strand shall be of large and small diameter wires, laid alternately. There are three sizes of wire in the strand.

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"SEALE" construction is to be made in one operation, consisting of 6 strands of 19 wires or of 21 wires to the strand. The outside wires are to be 9 in number of one diameter around 9 smaller wires, the center wire is to be of larger diameter. There are three sizes of wires in the strand.

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"FILLER" wire construction is to be made in one operation, consisting of 6 strands of 19 wires or of 21 wires. All the wires except the center wire are to be of approximately the same size; the center wire is to be slightly larger. The filler wires are used to support the structure and are, therefore, not considered as component wires in the rope so far as strength is concerned.

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THE process of deterioration of differently constructed ropes in relation to the number of bends around sheaves is shown in Fig. 4, in the lower curves.

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The four wire ropes were subjected to the following tests:

"a" Lang-lay rope of Seale-construction /6. (.1, 5+9.0,7+9.1,2 + 1 Hemp Core/.

"b" Regular-lay rope Seale of the same construction as "a".

"c" Lang-lay of normal (ordinary) construction:/6.(1+6+12) of 114 wires.

"d" Regular lay—rope of the same construction as "c".

The ropes "c" and "d" were made of a wire of the same diameter and of the same tensile strength—130 kg/mm².

THE difference in properties of "a" and "b" wire ropes may be easily seen on the chart of Fig. 4.

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THE rope "a" appears to be very durable under the bends over sheaves but full termination (exhaustion) of its reserve strength comes at the degree of deterioration of rope of about 2.5 per cent., while the rope "b", although it is not as durable under the bends, loses its reserve strength much slower and exhaustion of its reserve strength comes after the 10% degree of deterioration of rope.

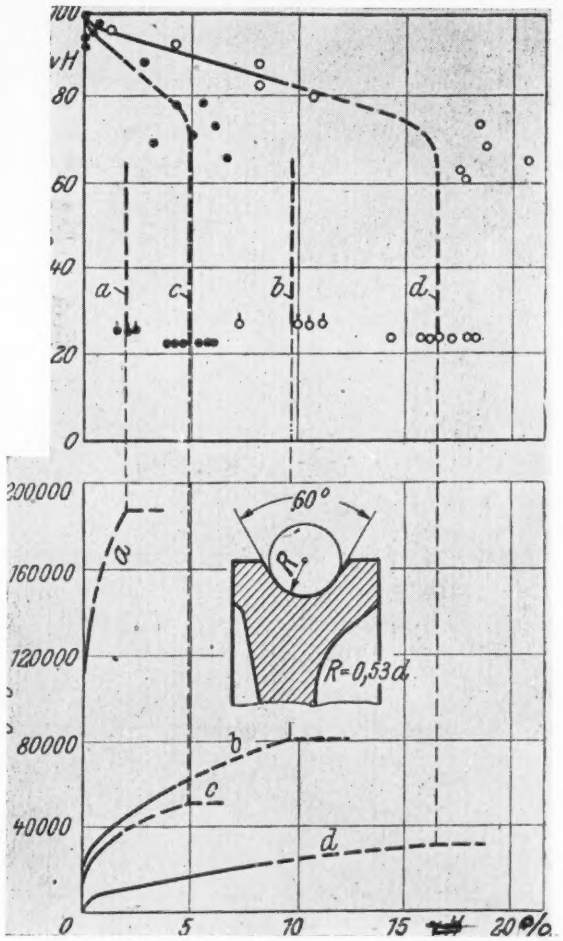

Fig. 4. (upper). Relation between the decrease in reserve (remaining) strength of regular-lay and Lang-lay ropes shown in % from initial ultimate strength of ropes and the degree of deterioration of these ropes. (Lower). The degree (process) of deterioration of different constructed ropes in relation to the number of bends over sheaves of 400 mm diameter.

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THE ropes "c" and "b" show the analogous properties. The rope "c" is more durable under the bends over sheaves than the rope "d" (see lower curves on Fig. 4), but the rope "c" loses more of its reserve strength under the same degree of deterioration and exhaustion of its reserve strength comes at the degree of deterioration of about 5% while the rope "d" loses its reserve strength at the degree of deterioration of about 17%.

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THE lower curves for the life of ropes on the Fig. 4 show the relative behavior of **Lang-lay** and **regular-lay** ropes tested on a machine in which the ropes passed with bends made in one direction over sheaves of 400 mm. diameter.

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THE greater length of life of the **Lang-lay** rope is evident.

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THE **Seale** construction ropes under the bends over sheaves show greater durability, than the ordinary construction ropes.

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FIG. 5 shows the process of deterioration of **regular-lay** ropes of ordinary construction: 6x(1+6+12)+1 Hemp core in relation to the number of bends over sheaves of 400 mm. diameter under the varying specific load of rope °Z from 10 kg/mm² to 50 kg/mm² (lower curves). Moreover from Fig. 5 may be seen that:

1) Under the same degree of deterioration of ropes comes the same loss of their reserve strength.

2) The exhaustion of reserve strength of ropes notwithstanding the varying specific load on ropes comes approximately under the same degree of deterioration.

3) Definite degree of deterioration of a rope with the increased specific load—comes sooner.

4) The exceeding of the definite allowable degree of deterioration of a rope with the increased specific load of rope causes the rapid destruction of a rope.

(Please turn to page 48)

Progress in Engineering Knowledge During 1935

By P. L. Alger

General Engineering Department, General Electric Company, Schenectady, N, Y.

Introduction

IN this third annual review of progress in knowledge useful to engineers, attention is directed first to the increasing amount of work being done on the problem of materials. No longer are engineers content to make the best use they can of materials supplied by nature, such as oil, shellac, and copper; they now request the scientists to make for them entirely new materials having the specific properties they desire. With ever greater confidence, the scientists are accepting such requests, and are fulfilling them by application of the new physics and chemistry to the building of made-to-order molecules and alloys.

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AS in earlier reviews, the developments in knowledge of materials, of design, and of application engineering will be separately considered.

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Studies of Alloys and Metals

AN exhaustive investigation of the properties of cobalt-molybdenum alloys was carried out,(1) resulting in the determination of the surprisingly complex constitutional diagram shown in Fig. 1. The age-hardening properties of these alloys and their many different phases of constitution make them of especial scientific interest. The use of x-ray photograms, microstructures, thermal analysis, electrical resistance, and thermal-expansion measurements to determine and correlate the data necessary in making up the diagram well illustrates the way in which modern metallurgists are employing every available device to pry into the secrets of the metals.

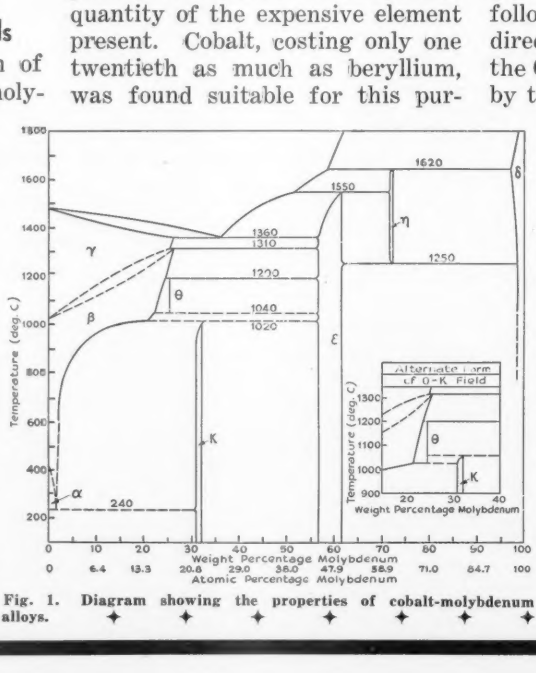

Fig. 1. Diagram showing the properties of cobalt-molybdenum alloys.

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ANOTHER important development in the alloy field has been the creation of a copper-cobalt-beryllium alloy, which has half the conductivity of copper and a greater hardness than any other copper-base alloy except copper-beryllium, and is age-hardening. (2) The 2.5 per cent beryllium-copper alloy has been known for some time to have splendid mechanical properties, but its high cost and only moderate conductivity have limited its usefulness. Study of the beryllium-copper alloy system showed the good mechanical properties of this alloy to be due to the precipitation of the compound Cu Be from solution. Means were sought, therefore, for reducing the solubility of beryllium in copper, so that precipitation would occur with a smaller quantity of the expensive element present. Cobalt, costing only one twentieth as much as beryllium, was found suitable for this purpose, its use enabling the amount of beryllium to be reduced from 2.5 to 0.4 per cent.

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THE orientation of the crystals in silicon sheet steel, both hot- and cold-rolled, and before and after annealing, has been determined by reflections of light from etched samples, by x-ray measurements, and by measuring the torque of a disk suspended in the plane of a strong magnetic field.(3) It was found that the varying with- and cross-grain properties of the steel and the differences between hot- and cold-rolled sheets are explained by the anisotropic properties of single crystals, and the existence of preferred directions of the crystal axes, which depend upon the treatment of the steel. Thus, in hot-rolled sheets the highest permeability is along an axis at 45 deg with the direction of rolling, followed by the 0-deg. and 90-deg. directions, and in cold-rolled sheets the 0-deg direction is best, followed by the 90-deg and 45-deg.

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IN manufacturing operations using copper wire, much trouble has been experienced from springiness, owing to the hardening of the copper when it is bent in passing over sheaves or in winding. Measurements of the hardness and elongation, formerly relied upon to indicate whether the wire is satisfactorily soft for use, have been found very uncertain guides to follow in testing wire for this purpose. It has been found that the resistance of the wire to bending does provide a sensitive index to

springiness, however, and practical correlations of these properties have been established.[4]

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FURTHER intensive studies have been made of the creep rate, or continued elongation of metals when they are simultaneously subjected to mechanical stress and to high temperatures. [5] To facilitate this work, an automatically controlled creep-test furnace has been designed, in which tests are carried on for continuous periods of many thousand hours. Fig. 2 shows typical results obtained on an annealed nickel-chromium-molybdenum steel subjected to various stresses at an average temperature of 857 deg. F for a period of 10,000 hr. The continuous and nearly constant creep rates maintained even after this long period under stress are of great interest to designers of high-temperature equipment.

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SOME steels, however, have a continually decreasing rate of creep under sustained stress, and so may prove far stronger in the long periods of actual service than other alloys that have much lower initial creep rates. [6] Careful microscopic studies of the crystal structures of the many alloys subjected to these creep tests have disclosed a definite correlation between low creep strength and a banded structure, or dendritic segregation. [7] Further study of the causes of this condition showed that the uniform structure necessary for acceptable creep strength can be produced by sufficient forging reduction. As banded steel must be reduced at least ten to one in diameter, however, for good results, this method is not usually practicable.

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STILL further investigation developed the fact that one method of controlling the objectionable dendrite formation is by cooling the molten metal in the ingot mold so as to give the maximum nuclei formation. Thus, by a widely ramifying series of tests and a careful follow-up of each clue as it was developed, it now appears that reliable alloys of greatly increased creep strength can be produced, which in turn will lay the foundation for new progress in high-temperature turbines and improved power-station efficiencies.

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ONE of the most difficult practical problems in the construction of vacuum tubes is making the necessary seals between glass and metal. It is necessary to make a vacuum-tight seal with high insulation strength between the metal conductors that must enter the tube and the walls of the tube itself. Glass and Mycalex are the only suitable materials for such seals so far developed. All the smaller tubes use glass seals, but these have in the past been sensitive to breakage under varying temperature conditions.

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THEORETICAL and photoelastic studies of the stresses developed in these glass-to-metal seals under varying temperatures have clearly shown that the thermal expansion curves of the glass and metal must match almost exactly if sturdy high-strength seals are required[8]. Careful tests have been made to determine what effects different constituents, such as lithium, potassium, and sodium oxides, have on the thermal expansion curves of glass, but no glasses that will match the linear expansions of ordinary metals have been discovered. [9] The thermal expansion rates of all known glasses increase markedly at high temperatures, so that the problem of making a good seal was resolved into that of developing a metal alloy with a similarly curved thermal-expansion rate.

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AFTER a very extensive investigation, there has been developed a new iron-nickel-cobalt alloy called Fernico, which does have a thermal expansion curve almost exactly matching that of a special glass that is suitable for use in modern vacuum tubes. [10] Development of this alloy has vitally contributed to the advent of the new metal radio tubes, which will be subsequently mentioned, as well as marked

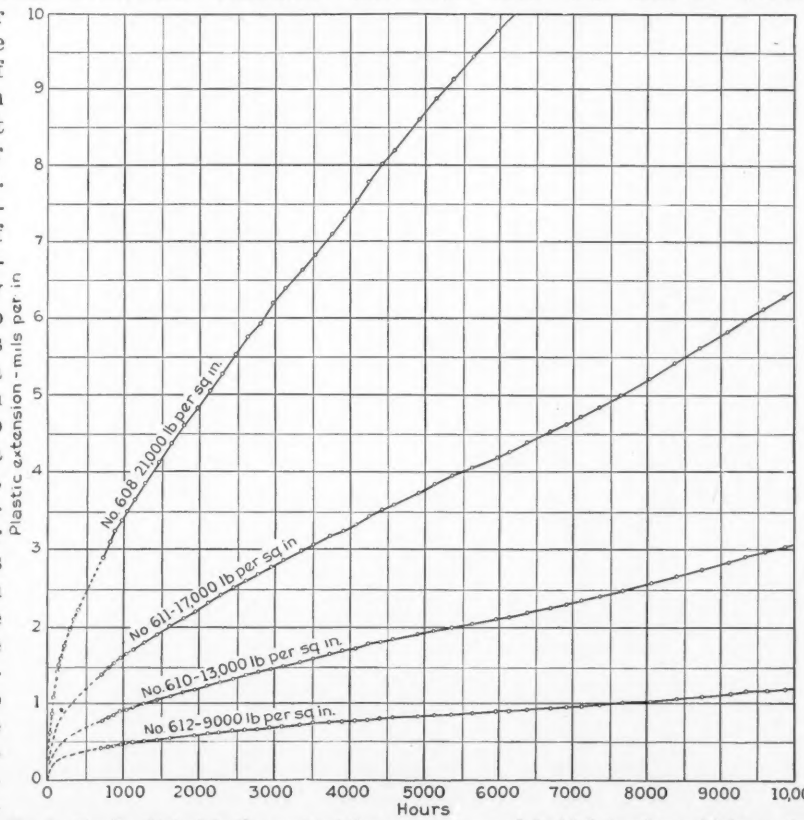

Fig. 2. Results obtained in the creep-test furnace on an annealed nickel-chromium-molybdenum steel subjected to various stresses at an average temperature of 857 deg. F. for a period of 10,000 hr. ✦

improvements in power tubes. Fernico is employed for the lead-in wires and also for metal eyelets set into the walls of the tube, and rings or cylinders of glass seal the space intervening between the two Fernico parts.

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Insulating Materials

IN connection with the study of the oxidation of oils, an improved method of determining the oxygen content of oils containing sulphur and nitrogen was devised, (11) consisting of passing the oil vapors over a thoria-coated nickel catalyst in a hydrogen atmosphere, and then over calcium sulphate. The method has proved accurate and convenient, and is believed to be generally applicable to the measurement of small amounts of oxygen contained in sulphur compounds.

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SOME fascinating new relations have been established between the temperature, pressure, and dielectric strength of mineral oils, all in relation to the amount of air dissolved in the oil. (12) The dielectric strength of transformer oil is known to increase with applied gas pressure, and to vary with temperature up to a maximum at about 100 deg C and then to decrease. Measurements of the amount of air held in solution in the oil under these various conditions show an exact correlation between the dissolved air density and the dielectric strength. It is thus suggested that the breakdown of oil containing dissolved gas may involve the critical separation of the dissolved gas from the solvent oil, making the breakdown of the impure oil occur in a distinctly different manner from the breakdown of a pure, or gas-free oil.

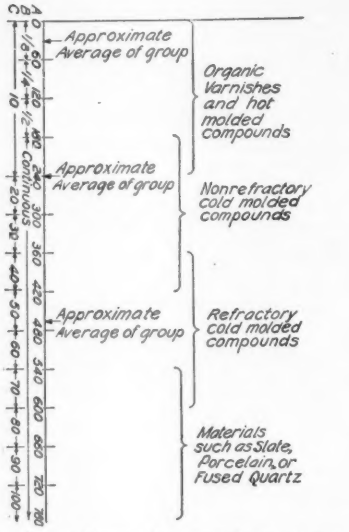

Fig. 3. Arc resistance of general classes of solid dielectrics. A: Total time in seconds. B: Proportion of time current is on. C: Arc current in milliamperes.

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MEASUREMENTS were made of the evolved gas, the acidity, the mechanical properties, and the dielectric strength of paper after varied temperature-time exposures. (13) It was found that cumulative chemical deterioration of the paper is produced by temperatures above 110 deg C, and that temperatures as low as 95 deg C produce similar effects when high-potential stress is applied simultaneously. The deterioration is accelerated if the evolved gases are unable to escape easily, as in tight-wound rolls.

AT the other extreme of insulating materials from oil is porcelain. Its dielectric strength, also, however, is markedly dependent on the volume of included air, or porosity. Improved methods of minimizing the porosity and sealing porcelain against entrance of water have been described. (14)

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A NEW procedure for measuring the arc-resistance of insulating materials has been developed, (15) enabling quick and consistent rating of the ability of materials to retain high resistivity even though subjected to an electric arc. The tests indicate that failure of organic materials under arcing is due to chemical decomposition, while failure of inorganic materials is caused by melting. The arc resistance of solid dielectrics of different classes determined in this way is shown in Fig. 3.

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Cellulose Acetate Treatment of Textile Insulation

By E. B. Wood,

Bell Telephone Laboratories, New York, N. Y.

SILK and cotton have been the standard materials employed for wire insulation in telephone central offices for many years. These materials in the form of wrappings or braidings used either singly or in combination, and supplemented for some purposes by enamel and impregnating waxes, provide sufficient insulation to withstand the comparatively low voltages required to operate telephone apparatus. Also this type of insulation occupies small space, can be applied in a large number of color combinations, and is not easily damaged by handling. Silk and cotton, however, absorb moisture from the air and may exhibit very undesirable variations in electrical characteristics under variable conditions of humidity.

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DEVELOPMENT work to improve textile insulations has had two objectives: to provide at moderate cost a super quality insulation for use where it is important to have the best electrical characteristics obtainable, such as in toll circuits; and to improve the characteristic of cotton sufficiently to permit its use to replace silk as far as possible for general purposes. Within the past few years, two methods of improving the electrical characteristics of textile insulation have been brought into commercial use. The first, already described elsewhere, is the purification of silk and cotton whereby electrolytic impurities, such as sodium and potassium salts, which are inherent in the commercial materials, are removed by a simple and inexpensive washing process. The second is the treatment of textile-insulated wire with cellulose acetate.

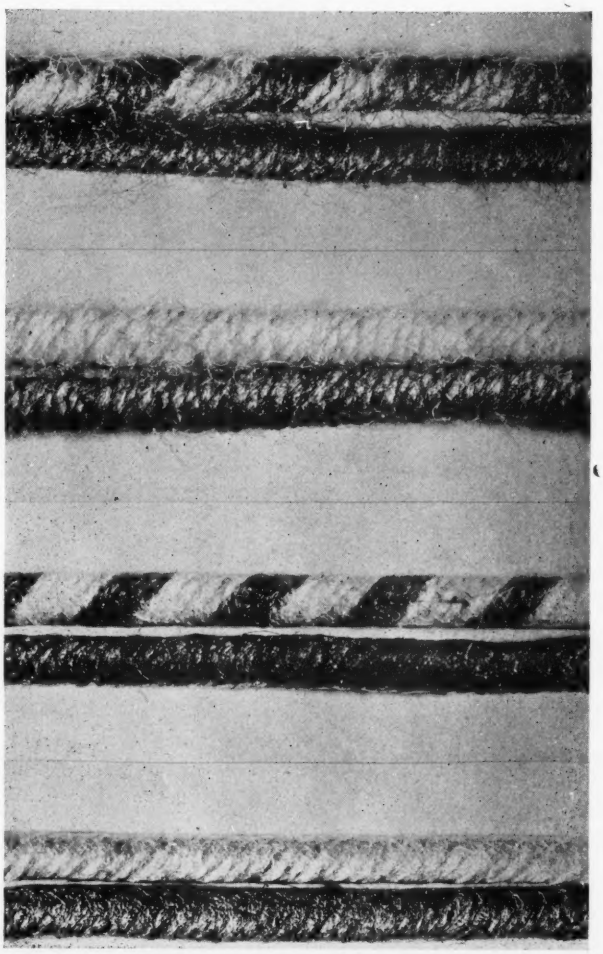

Fig. 1—Enlarged Photograph of treated and untreated wire showing how the cellulose acetate film smooths down and covers the textile fibers.

SEVERAL years ago cellulose acetate in the form of artificial silk was investigated as a possible substitute for natural silk in wire and cable insulation. Although its electrical characteristics were found to be excellent, the application of the material in the form of a lacquer to cotton or silk insulation appeared more promising because, at that time, commercial means of handling the acetate silk on high speed insulating machinery had not been developed.

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CELLULOSE acetate is made by treating cellulose fibres, usually cotton, with glacial acetic acid and acetic anhydride, together with a catalyst such as sulphuric acid. This process is followed by precipitation, purification, and drying, which yields a product in the form of a white flaky mass that, when dissolved in acetone, produces a clear transparent lacquer. The insulated conductor to be treated is passed through a wiping die to remove the excess lacquer, and following this to a heated drying chamber where the solvent is evaporated. This process is repeated several times, to build up a film of satisfactory thickness and smoothness.

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THE film so formed has a high dielectric strength, low conductivity, and low a-c capacities and

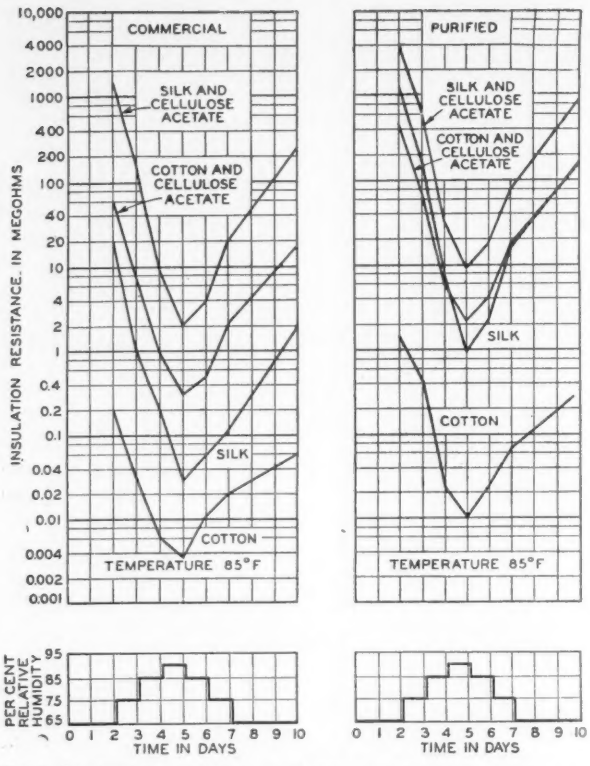

Fig. 2—D-c insulation resistance of 50 feet of twisted pair 22-gauge wire insulated with double servings of equal thickness. These data show that commercial cotton may be improved from 100 to 300 fold by acetate treatment alone and from 500 to 2000 fold by purification plus acetate treatment.

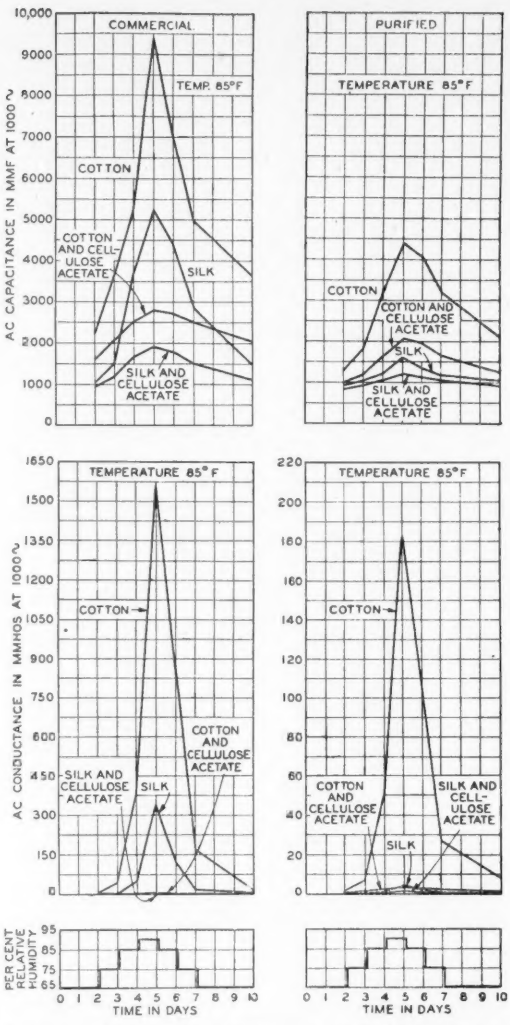

Fig. 3—A-c capacitance and conductance of 50 feet of twisted pair 22-gauge wire insulated with double servings of equal thickness. Curves on the left are for commercial textile insulation, and those on the right purified

conductance. Also it absorbs much less moisture than silk or cotton so that its characteristics vary less with changes in humidity. It does not however, prevent the entrance of moisture to any appreciable extent into the textile over which it is placed. From this fact and from extensive laboratory tests, it was concluded that the improvement in electrical characteristics brought about is due mainly to the lacquer film acting as a barrier in the leakage paths between two pieces of insulated wire.

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ITS effect may be seen in Figure 1, which shows enlarged photographs of sections of both treated and untreated wire. With untreated cotton insulation, fibres project in all directions and form connecting leakage paths between the two conductors when moisture is present. With the fibres smoothed down and covered with several layers of lacquer film, these leakage paths are largely eliminated and any current leakage must pass through this relatively high resistance film. Repeated tests have shown that the improvement obtained in a treated wire may be gauged by observing the extent to which the fibres have been laid and covered by the lacquer film. Even cracking of the film, which may occur during manufacture or subsequent handling, does not affect the electrical characteristics appreciably so long as it is not severe enough to permit interlinkage of the textile fibres.

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INCREASING the thickness of the lacquer film beyond that required to cover the fibres and provide a smooth surface results in little additional improvement in the insulation. This is of considerable economic advantage since, with proper methods of application, a relatively thin film may be practically as effective as a thick one requiring a considerably greater quantity of material. It also permits a rapid check on the quality of the product by a visual inspection of the surface condition of the treated insulation.

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THE effectiveness of cellulose acetate treatment in improving the electrical characteristics of silk or cotton used as wire insulation is shown by the accompanying illustrations for a constant temperature of 85° F., and for relative humidities varied from 65% to 90% over a seven-day cycle. As a matter of general interest the com-

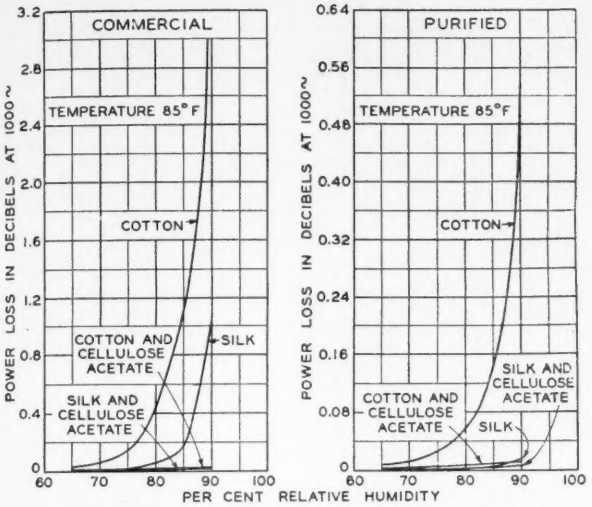

Fig. 4—The data of Figure 3 converted to transmission loss, shows how cellulose acetate treatment reduces the loss at the higher humidities.

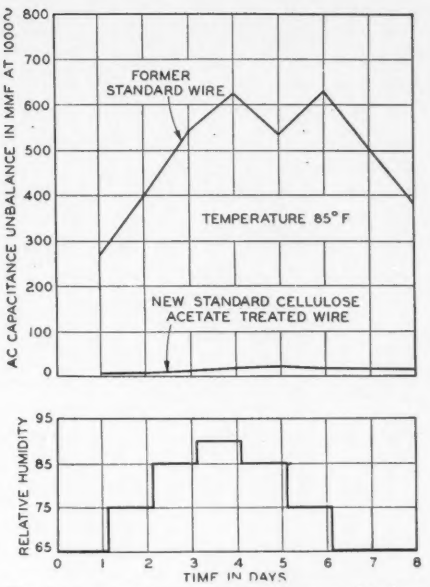

Fig. 5—A-c capacitance unbalance between the phantom and side circuits of 50 feet of quadded 22-gauge wire.

parison is given for both commercial and purified materials although purified textiles are now employed exclusively in wire insulation for central offices of the Bell System. The data shown illustrate the improvement brought about by the treatment of the respective materials as insulation, but do not apply quantitatively to any standard type of central office wire.

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DATA on insulation resistance, given on Figure 2, show that purified cotton, when treated with cellulose acetate, becomes a comparatively high grade insulation, suitable for many purposes that would have required expensive combinations of silk and cotton heretofore. For telephone transmission purposes, the a-c characteristics of conductance and capacitance are of particular importance because they determine the transmission loss at voice and carrier frequencies, which must be kept at a minimum to maintain high quality communication. Data for these two characteristics at 1000 cycles are given on Figure 3. The data of these two graphs, converted into transmission loss, are represented on Figure 4. Of particular significance is the reduction of capacitance and conductance at the higher humidities, since it is very important for good telephone transmission that these characteristics do not vary greatly with changes in weather conditions.

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ONE example of how treatment with cellulose acetate improves telephone transmission is given by Figure 5 which shows the capacitance unbalance at 1000 cycles between phantom and side circuits in a four conductor wire for toll use. Capacitance unbalance is the main cause of electrical interference between two associated circuits and should therefore be kept low. As shown here, treatment with cellulose acetate not only materially reduces the unbalance but makes it less dependent on humidity. Although there was some difference in design of the two types of wire tested, practically all of the improvement was due to the treatment.

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THE improvement in characteristics obtained by cellulose acetate treatment is sufficient in many cases to permit the substitution of cotton for silk, which results in a substantial reduction in cost. In other cases silk is retained and the cellulose acetate treatment results in a cable of much higher quality, which is desirable for many toll circuits. This treatment has also made possible the elimination of enamel in a large amount of cable where it has formerly been required to prevent excessive leakage under high humidity. The economic importance of this arises from the ease with which the textile insulation may be removed for soldering. Enamel is difficult to remove and the precautions necessary to prevent faulty soldered connections increase the cost of installation and maintenance of apparatus.

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WIRE treated with cellulose acetate has been found particularly advantageous for use on distributing frames. Here the wire cannot be used in cable form, and to guard against the fire hazard from a large mass of loose wire, it has been standard practice heretofore to cover the wire with a cotton braid impregnated with flame-proofing salts. These salts, because of their hygroscopic and electrolytic nature, have a deleterious effect on the electrical characteristics of the insulation under humid conditions. Exhaustive tests have proved, however, that cellulose acetate treated wire, without the addition of flame-proofing salts, is as safe as the old type, and the elimination of the salts has made it possible to provide a wire greatly superior to the old electrically, considerably less expensive to manufacture, and smaller in size.

ANOTHER advantage in cellulose acetate treatment is its effectiveness in preventing unwrapping and fraying of the textile at terminals. With untreated wire, fraying has been diminished by impregnating the insulation at the ends of the wire with wax, but this adds to the flammability, tends to obscure the color markings, and collects dust. Acetate treatment holds the insulation together, and at the same time provides a glossy surface that does not readily collect dust.

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CELLULOSE acetate is very stable both under normal use and when exposed to artificial aging tests. Tests in the Laboratories running over a period of years have shown that high humidities and temperatures produce very little deterioration in either physical or electrical characteristics.

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THE application of cellulose acetate treated wire to regular production was made early in 1930, although considerable quantities were installed for service trials in commercial apparatus in 1927. Cables and wires used in the toll plant, where the improved characteristics are of greatest value, are being changed first to employ the new insulation. Supplementing this program, consideration is being given to extending the use of cellulose acetate treated wire to the local plant where the annual requirements are of the order of three billion feet. Application of the new wire is being made gradually so that manufacturing and installation methods and technique may be further developed as conditions seem to warrant.

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Japanese Entering Domestic Wire Heddle Market

EARLE H. THOMAS, of George W. Prentiss & Co., Holyoke, Mass., in a recent letter stated "It has just come to the writer's attention that the Japanese have entered the picture and are sending in a very good looking twin heddle. My information is that an item which sells here for $2.60 per thousand is up against a Japanese price of $.45. Due to the fact that it is a good heddle and sells for such a low price it is stated that in addition to hurting domestic manufacture of twin heddles this will also cut into the use of the flat steel heddle."

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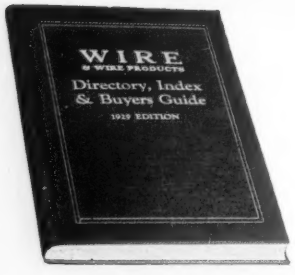

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A New Type of Insulating Machine

By Austin Casey

Syncro Machine Co., Newark, N. J.

The introduction of new types of insulations, such as Cellophane, cellulose acetate and fine papers, has created a fast growing demand for precision in wire insulating machinery. This article describes a recent development. ✦ ✦ ✦ ✦ ✦

THE demand for new and better types of insulations by the electrical equipment manufacturers is rapidly becoming evident and is growing in intent every day. It therefore behooves the wire manufacturers to equip themselves to profitably meet this demand. To hope to be able to efficiently and economically do this, new and better equipment is absolutely necessary.

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LET us first consider the fact that the new types of insulations, such as Cellophane, cellulose acetate and fine papers, are considerably more difficult to apply than the older types of coverings. This being so, we must find a more practical and economical means of applying these insulations. Surely we can not expect antiquated machinery to solve this problem for us. In the first place the older types of machinery were built to serve a single purpose. It is quite evident that a unit which is to be at one time both efficient and economical can not be so limited. Consequently, equipment must be had that is universal in its scope and entirely flexible in its convertability. This is true whether a machine is to be put into a steady line of production or if it is to be used for different types of insulations, for none of us can forecast the needs of tomorrow accurately enough to tie ourselves down too tightly.

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ONE machine which is highly examplatory of this theory is the **"Syncro"**. The Syncro machine is designed for spirally wrapping web and strand insulations on a core, or more specifically, on wire. In order to apply any or all of the web and strand insulations to wires without having to radically adapt the machine for each different type of covering, a means was sought for overcoming this defficiency, heretofore common to wire covering machines.

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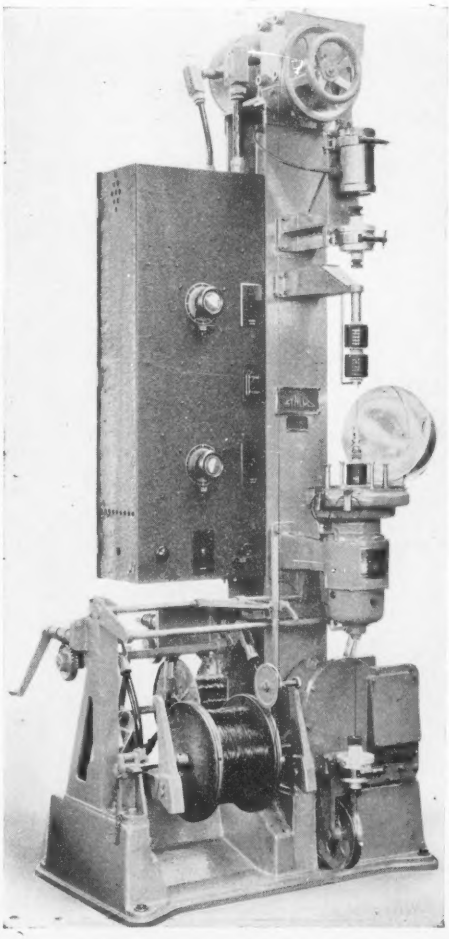
THE first step in attaining this purpose was the discarding of the older conventional methods of transmission and starting anew. An entirely new type of transmission was therefore evolved for the purpose in which the flyer or spindle motor is electrically related to the capstan motor so that both of these motors are perfectly synchronized at all times. This synchroism prevails at all operating speeds and during the starting and stopping of the machine. This first step overcame many of the stumbling blocks which are offered by mechanical type drives and it entirely eliminated backlash and slippage which is inherent in gear and belt driven machinery.



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FROM this point the machine was slowly developed with great care, in order that handicaps heretofore suffered might be eliminated where possible. As the machine stands today we find the "Pay-off" unit in the rear. The "Pay-off" or supply arbor is mounted on a polished bearing surface and an adjustable brake is attached to one end of the arbor, so that the required tension can be applied to the supply reel. These arbors are designed to accommodate any desired range of reels commercially used for wire sizes for which the machine is designed. The wire passes from this unit, underneath the machine, through a duct which aligns the wire with the bottom guide sheave. This sheave directs the wire upward. Above this sheave is an adaption for an adhesive applier. From this point the wire passes through the spindle motor to the nosepiece where the insulation is actually wrapped on the wire. The wire then travels through the cop supply magazine, above which there is another mounting bracket for a lacquer applier. Directly above this unit is an electric dryer for drying off the solvents of the lacquer so that the insulated wire is touch-dry by the time it reaches the capstan. The

capstan propels the wire through the machine and then the wire travels to the "Take-up" unit where it is respooled and evenly distributed on the take-up reel.

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THE synchronism existing between the capstan and flyer units is obtained by using a specially wound motor-generator set which is directly connected to the capstan and electrically connected to the flyer. This affords a positive relation between these two units which results in perfect synchronism and positive drive.

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THE capstan is driven through a changeable set of gears. These gears are easily changed and are so arranged as to give any desired linear speed within the limits of the machine to the wire and thus allow a wide selection in the amount of overlap obtainable. These gears are located in a gear box immediately back of the capstan. The gears are hardened and a splash feed oiling system is used for lubrication. The rotor of this unit is mounted on ball bearings. All the gears are easily accessible by removing a cover on top of the box. The capstan can be disconnected from this drive by loosening a hand wheel. The capstan motor is mounted in back of the gear box and directly drives the gears.

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THE flyer unit, the operation of which is synchronously controlled through the capstan unit, is vertically mounted on the column. The flyer motor is equipped with ball bearing mountings and designed so that these bearings are fully protected from dirt and foreign matter. The flyer is reversible and has a variable speed control. The speed of the flyer ranges from 2500 to 4800 R.P.M. The rotating parts of the flyer are statically and dynamically balanced in order to obtain smooth, vibrationless operation, so necessary to continuous efficient serving. The rotating flyer base is of the "post type".

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ONE of the more important features of the machine is an adjustable cop holder which can be delicately set for all tensions and at the same time maintains a steady, smooth pay-off of insulation from the cop. This allows materials of widely different tensile strengths to be efficiently served under commercial conditions. It also eliminates the "loose and tight" wrapping which results from uneven tensions on the cop holder. This fault of "loose and tight" wrapping seriously affects the electrical and mechanical characteristics of the insulation and more especially in cases where web insulations are used.

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THE introduction of new types of insulations necessitated the development of new types of nose pieces. Of particular interest is the development of an entirely new type of nose piece which, due to its cleanliness and adjustability, is particularly adapted for use where adhesives are applied.

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THERE is a helmet which is hinged over the flyer which cuts down to a minimum the troublesome wind resistance encountered at high speeds. The helmet is equipped with glass peep holes which admit light and allow observation of the progress of the serving.

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AN automatic brake is also used in conjunction with the flyer. This brake can be evenly and closely adjusted to stop the machine well within four seconds from the time the stop button is pushed.

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SEVERAL types of automatic stops have been devised which stop the machine when the end of an insulation cop is reached or in the event of a break in the insulation. The latest type "auto-stop" designed is positive in its action as are the others and is chiefly advantageous in that it has no adjustments.

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ONE of the most important features of the machine is its take-up unit. A large range of spool sizes can easily be accommodated with no appreciable change. The traverse stroke is adjustable for various reel sizes and it can be further adjusted to compensate for variances in individual reels. The take-up arbor on which the reel is mounted is directly driven by a torque motor, rather than a friction clutch. This affords a smooth re-spooling action and enables a constant tension to be held with but one adjustment. A wide range of tensions from 3 oz. to 12 lbs. can be obtained merely by setting a rheostat to give the desired amount. Thus the Syncro take-up is a vast improvement over mechanical clutches which are subject to constant wear which necessitate frequent adjustment and maintenance.

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THE adhesive and lacquer appliers are easily mounted or demounted by means of a clamp, bracket. These pots are easily adjusted and apply a consistently uniform coating to the wire. Once set they hold their adjustment and any desired amount can be applied.

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AN electric heater is used in conjunction with these appliers. It is mounted in the same manner and can be set for temperatures exceeding 400° F. Once the heat selected is reached, the heater maintains a constant temperature.

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A CONTROL box is built into each individual machine which contains the necessary controls for the entire unit. On the panel of the control box is found individual switches for both the capstan motor and also for the take-up motor. There is no switch needed for the flyer motor as it is in the same circuit as the capstan motor. There is also a variable speed control for the flyer and a variable tension control for the "Take-up" unit. Wherever provision is made for a heater there is also the necessary switch and variable control with an indicating light. The "start and stop" button for the machine is conveniently located in the middle of the box. This compact control

(*Please turn to page 49*)

Outstanding Personalities of the Wire Industry

Otto F. Jagielski

OTTO F. JAGIELSKI, Consulting Wire Mill Engineer, has just returned from Holland where he has completed the reorganization of a large electric wire and cable concern along American lines.

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IN connection with the reorganization of this plant, European machinery and equipment has been replaced with American machinery with a consequent material increase in plant efficiency and lowering of operating costs.

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WHILE abroad, Mr. Jagielski also made a trip to Germany visiting a number of electric wire and cable concerns to study the possibilities of selling this type of American machinery in Europe. He has found that while the American equipment is superior to the European, the market possibilities are somewhat limited because of the price differential.

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AS a result of the survey trip, Mr. Jagielski expressed the opinion that a good practical book published in the United States on American practises, embodying details of American machinery and equipment for the manufacture of insulated wire and cable, would probably serve a very useful purpose in educating the European industry in American methods and would assist the sale of American-made machinery and equipment. He stated that he was considering the publication of such a book from this viewpoint to be published in English, French, German and Spanish.

✦ ✦ ✦

C. C. Henning Receives Robert W. Hunt Reward

A DISTINCTIVE honor, the Robert W. Hunt Award, has been conferred upon **C. C. HENNING,** Assistant General Metallurgist of the Jones & Laughlin Steel Corporation.

OTTO F. JAGIELSKI
Consulting Engineer

THE award, made to Mr. Henning for his paper, "Manufacture and Properties of Bessemer Steel" is an annual prize given by the American Institute of Mining and Metallurgical Engineers for what is considered to be the best technical paper of the year on the manufacture of iron and steel. The paper was presented by the author last February in New York at a meeting of the Iron and Steel Division of the Institute, of which he is a member.

✦ ✦ ✦

MR. HENNING has been identified with Jones & Laughlin during practically his entire business experience. He joined the company in June 1915 in the Metallurgical Department of the Pittsburgh Works and advanced through various capacities to his present position. He is a member of the American Society for Testing Materials and the American Society for Metals.

✦ ✦ ✦

J. K. Sutherland Supt. Sheet & Tube Blooming and Hot Strip Mills

James K. Sutherland, superintendent of the Sheet & Tube blooming mills, has been named superintendent of the combined blooming and hot strip mills.

John Vohr Joins Granite City Steel Co.

John Vohr has resigned as superintendent of the new hot strip mill of the Youngstown Sheet & Tube Company, to join Granite City Steel Company, Granite City, Ill., which is installing a new hot strip mill.

✦ ✦ ✦

Charles H. Krueger

Charles H. Krueger, vice president of the Chase Brass & Copper Company Inc., also a member of the board of directors, and treasurer of the Copper and Brass Warehouse Distributors Association, died in New York on December 6th. He had in recent years devoted many hours and days to co-operative efforts in the interest of the association and the welfare of distributors of copper, brass, bronze and related alloys.

He went to the Hungerford Brass & Copper Company as office manager in 1908. He became general manager of the Hungerford firm and in 1926 when it was taken over by the Chase Brass & Copper Company, when he became vice president of the company.

✦ ✦ ✦

Steel Club of Philadelphia Elects Officers

W. W. Deal, district manager of the American Steel & Wire Company has been elected president of the Steel Club of Philadelphia; **H. E. Richardson,** district sales manager of the Youngstown Steel & Tube Company, Youngstown, Ohio, vice president, and **F. L. Shants,** district sales manager of the Lukens Steel Company, Coatesville, Pa., reelected secretary and treasurer. **L. L. Caskey,** assistant district manager of Republic Steel Corporation, Youngstown, Ohio, and **H. H. Ziesing,** manager of sales, Midvale Company, Nicetown, Pa., were elected directors.

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Exports and Imports of Wire

Exports of Iron and Steel Wire Products in Oct. 1935 and Oct. 1934
(In gross tons)

	Oct. 1935	Sept. 1935	Oct. 1934
Wire rods	2,473	2,200	483
Hoops, bands and strip steel	4,803	3,366	1,646
Plain black or galvanized iron or steel wire	4,823	2,548	2,988
Barbed wire and woven wire fencing	3,671	1,784	3,117
Woven wire screen cloth	95	73	56
Wire rope	196	307	257
Insulated iron or steel wire and cable—see analysis below			
Other wire and manufactures	538	298	286
Wire nails	1,041	830	887
Tacks	43	40	34
Other nails, including staples	225	190	261
Bolts, machine screws, nuts, rivets and washers	538	575	394
Total, these 11 classifications	18,446	12,211	10,409

Imports of Iron and Steel Wire Products Into the United States
(In gross tons)

Concrete reinforcement bars	76	494	17
Hollow bars and drill steel	141	177	60
Merchant steel bars	.....	39	1,456
Wire rods	2,475	1,495	231
Barbed wire	2,935	1,931	365
Round iron and steel wire	357	308	159
Telephone and telegraph wire	2	.....	.....
Flat wire and strip steel	214	161	151
Wire rope and strand	178	190	213
Other wire	212	132	62
Hoops and bands	1,741	2,525	1,739
Nails, tacks and staples	2,640	2,237	367
Bolts, nuts and rivets	6	6	19
Total, these 13 classifications	10,987	9,695	4,839

EXPORTS
INSULATED WIRE AND CABLE, OCTOBER, 1935

	Foreign		To U. S. Possessions	
	Pounds	Dollars	Pounds	Dollars
Insulated iron or steel wire and cable	20,340	$ 2,650	100	$ 10
Rubber-covered wire	307,957	70,720	45,968	9,448
Copper weatherproof wire	155,939	21,794	32,631	4,990
Copper telephone cable	99,986	19,644	8,312	1,851
Other insulated copper wire	355,391	74,218	76,646	14,178
Nickel-chrome electric resistance wire	26,479	32,539	3	12
Total, these 6 classifications	966,092	$221,565	163,660	$30,489

Exports

IRON and steel exports from the United States during October at 238,358 gross tons fell short of equaling the September volume by only 2.5 per cent, despite the lowest shipments of scrap iron and steel in months. The October volume also held at a level 8.2 per cent in excess of shipments effected during the corresponding month of last year.

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A SHARP 10,318-ton gain in skelp shipments, aided by a substantial gain of 2,794 in steel bars, and increases of 1,000 tons or more in barbed wire, waste—waste tin plate, cold rolled strip steel, plain wire, car wheels and axles, and tin plate and taggers' tin, in a large part offset the 24,686-ton decline in the iron and steel scrap total. In only two items—excepting scrap—did losses of 1,000 tons or more occur (heavy rails, and black steel sheets).

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IMPORTS continued at a high level during October, the 59,569-ton trade gaining 12 percent over receipts during the previous month which in itself was the monthly peak over the past two years. The total for the first 9 months of 1935 at 358,824 tons was 28.9 percent greater than receipts during the corresponding period of last year.

✦ ✦ ✦

SCRAP iron and steel maintained its position as the principal iron and steel product shipped during the month — from a tonnage standpoint—the aggregate 145,850 tons finding outlet chiefly in Japan, 46,408, Italy, 44,301, the United Kingdom, 19,781, Canada, 16,054, and Mexico, 5,182. Skelp, iron or steel ranked next the total of 13,212 tons all going to Canada. Tin plate and taggers' tin ranked next the trade of 12,444 tons finding widespread outlets chief among which being Uruguay, 2,001, Soviet Russia, 1,953, Brazil, 1,406, Argentina, 1,349, and Mexico, 928. Black steel sheets, the next product, also found numerous markets, the 6,646 tons shipped going chiefly to Canada, 3,615, Mexico, 1,405, Soviet Russia, 445, China, 279, and Brazil, 194. Steel bars shipped to the amount of 6,176 followed and went mostly to Canada, 3,450, Panama, 654, Chile, 593, the Philippine Islands, 357, and Cuba, 192. 'Other Plate' made up the sixth product, the chief purchasers in the 4,764-ton trade including Mozambique, 2,037, Canada, 1,107, South Africa, 658, Cuba, 335, and Chile, 162.

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JAPAN, although its purchases of iron and steel scrap were the lowest in months, continued to rank as the leading individual market on a tonnage basis, its 52,992-ton trade for the most part being made up of iron and steel scrap, 46,408, waste-waste tin plate, 2,152, tin plate scrap, 2,108, ingots, blooms, etc., 1,000, and wire rods, 784. Canada followed with a widespread trade aggregating 48,102 tons of which the chief products were iron and steel scrap, 16,054, skelp, iron or steel, 13,212, black steel sheets, 3,615, steel bars, 3,450, plain shapes, 2,389, and strip steel, cold rolled, 1,747. Italy with participation to the extent of 44,746 tons ranked next, this amount chiefly including iron and steel scrap, 44,301, and car wheels and axles, 400, while the United Kingdom's total of 20,429 tons was practically all confined to iron and steel scrap, 19,781. Mexico's varied trade of 10,630 tons caused it to rank as the fifth market, the chief products moving in its trade being iron and steel scrap, 5,182, black steel sheets, 1,405, tin plate and

taggers' tin, 928, black steel welded pipe, 446, seamless casing and oil-line pipe, 341, and barbed wire, 316. The Philippine Islands followed with a total of 5,705 tons of which the chief items were iron and steel scrap, 3,134, galvanized steel sheets, 707, steel bars, 357, heavy rails, 238, and wire nails, 220.

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Imports

IMPORTS of iron and steel products into the United States during October continued their upward movement, the total of 59,569 gross tons rising 12 percent above receipts during the previous month, and 195 percent above those moving in the October 1934 trade. Fifteen foreign suppliers shared in this trade, 10 of them furnishing 1,000 tons or more. Compared with the preceding month, gains were noted in 16 iron and steel classifications, losses in 15, no change in 2, while in 4 products no trade whatever occurred during either month. The outstanding increases were registered in pig iron, 2,811 tons, and ferromanganese and spiegeleisen, 2,284 tons, followed by structural shapes, 1,499 tons, barbed wire, 1,004 tons, and wire rods, 970 tons. The chief decrease was occasioned in receipts of cotton ties, 1,512 tons, followed by welded pipe, 801 tons 'other hoops and bands', 774 tons. 'other pipe', 586 tons, and sheets, skelp, and sawplate, 250 tons.

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Sources of October Imports

CANADA continued to rank as the leading supplier of iron and steel products to the United States—on a tonnage basis—during the month under review, accounting for 18,036 tons, of which the chief items were scrap, 11,071, spiegeleisen, 4,171, pig iron, 2,427, and rails and rail fastenings, 305. Germany was next supplying 12,084 tons, the chief products in its trade being barbed wire, 2,539, nails, tacks, and staples, 1,969, sheets, skelp, and sawplate, 1,416, 'other pipe', 956, structural shapes, 926, and cotton ties, 789. The third supplier in the month's trade was Belgium which sent in 8,061 tons of which the predominating items were structural shapes, 2,650, bars, whether solid or hollow, 1,407, 'other hoops and bands', 1,190, rails and rail fastenings, 571, sheets, skelp, and sawplate, 516. The Netherlands ranked next, sharing to the extent of 6,394 tons practically all confined to pig iron, 3,735. British India the sixth source of supply, confined its participation solely to pig iron, 3,130 tons.

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CARD clothing receipts, 18,368 square feet valued at $25,234, moved upward by 3,868 square feet and $8,492 when compared with September, and for the most part came from the United Kingdom, 14,689 square feet valued at $19,548, Germany, 2,798 square feet valued at $3,823, and Belgium, 838 square feet valued at $1,597.

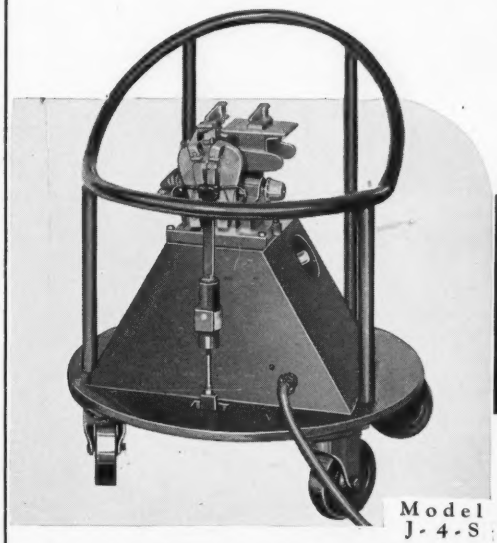
✦ ✦ ✦

WIRE cloth and screening imports, 59,184 square feet,

(*Please turn to page 52*)

Wins instant approval!

Low Type MICRO-WELD MODEL (Only 31" high)



Model J-4-S

The wide-spread demand for a portable, low-type welder is successfully met by this new MICRO Model J-4-S.

Height to welding dies—23".

Round steel base—no corners or edges to catch wires.

Frame—heavy rolled steel plates, arc welded.

Welding headpieces—hard bronze.

Full swivel casters—easy to move in any direction.

Guard rail—protects working parts.

Annealing dies for use on hard rolled and high carbon material—regular equipment.

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Quickly proves its convenience and efficiency wherever in use.

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Micro Model J-4-S solves many perplexing welding problems.

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20 N. Wacker Drive
Phone State 7468

PEORIA, ILL.
Factory and General Offices

A Review of Recent Wire Patents

No. 2,019,496, APPARATUS FOR PRODUCING COPPER AND OTHER METAL RODS AND THE LIKE, Patented November 5, 1935 by Frank J. Kohlhaas, Calumet, Michigan.

This apparatus is adapted for casting a continuous metal rod or wire, the molten metal being solidified without undue exposure to the atmosphere, being fed by gravity into a groove in a rotating table where the metal solidifies and is then drawn off.

✦ ✦ ✦

No. 2,019,519, METHOD OF AND MACHINE FOR ALTERING A STEEL ROPE, Patented November 5, 1935 by Henry Allyn Wood, Berkeley, Calif.

✦ ✦ ✦

No. 2,019,520, METHOD AND MEANS FOR JOINING INDIVIDUAL WIRES IN TWO ROPES TO MAKE A SINGLE ROPE, by Henry Allyn Wood.

These two patents cover a method and means for spreading a previously manufactured steel wire rope into its constituent parts, then effecting a desired change in the parts (such as substituting a new core) and finally retwisting the parts into a rope.

✦ ✦ ✦

No. 2,019,570, WIRE STRAPPING FOR PACKAGES WITH TWISTED TIE, Patented November 5, 1935 by Oscar Kind, Rodenkirchen, near Cologne, Germany.

Each of the pair of wires of this wire strapping has a sigmoidal side face resting against the similar side face of the other, the wires being twisted together.

✦ ✦ ✦

No. 2,020,188, CLOSURE FASTENER, Patented November 5, 1935 by Arthur M. Johnson, Lake Lillian, Minn.

A closure fastener is provided composed mainly of bent wire, of a heavy gauge, for the purpose of providing a latch fastener for barn doors and the like.

✦ ✦ ✦

Reissue No. 19,758, METHOD OF AND APPARATUS FOR COATING STRANDS, Patented November 12, 1935 by Carl M. Underwood, Washington, D. C., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

The apparatus includes a device for applying to the material an amount of coating material in excess of that desired in the finished product, the excess coating material being removed by mechanical means, after which a hot gaseous medium is applied to the coating material at points remote from all positions where the material has physical contact with the apparatus, to render the coating uniform.

✦ ✦ ✦

No. 2,020,657, Patented November 12, 1935 by Michael J. Riley, Cleveland, Ohio, assignor to The National Machinery Company, Tiffin, Ohio, a corporation of Ohio.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 17 East 42nd St., New York.

No. 2,020,658, MACHINE AND METHOD FOR MANUFACTURING BOLTS, Patented November 12, 1935 by Earl R. Frost, Tiffin, Ohio, assignor to The National Machinery Company, Tiffin, Ohio, a corporation of Ohio.

✦ ✦ ✦

No. 2,029,659, BOLT MAKING MACHINE, Patented November 12, 1935 by Earl R. Frost, Tiffin, Ohio, assignor to The National Machinery Company, Tiffin, Ohio, a corporation of Ohio.

✦ ✦ ✦

No. 2,020,659, BOLT MAKING MACHINE, Patented November 12, 1935 by Earl R. Frost, Tiffin, Ohio, assignor to The National Machinery Company, Tiffin, Ohio, a corporation of Ohio.

These patents cover improvements in automatic machinery for extruding, trimming, cutting and thread forming operations on bolt shanks and heads. The improvements include a heading device, a header slide, delivery mechanism for the thread rolling dies and transfer mechanism for moving the headed blank from one position of operation to another.

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No. 2,020,894, METHOD OF MAKING ENDLESS METAL CLOTHS, OR WIRE FABRICS, Patented November 12, 1935 by Hans Kurtz, Reutlingen, Germany.

More particularly the method is one for making wire fabrics where paper and other cellulose material is incorporated in the fabric and comprises removing the last weft wire at each end of the strip of which the endless cross is to be made, then bending up the end portions of alternate warp wires, placing the ends of the sheet so that the bent up warp wires of one end are opposite the unbent wires of the other end and finally fusing each bent up wire end onto the unbent end portion of the opposite wire.

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No. 2,020,940, MANUFACTURE OF WIRE, Patented November 12, 1935 by Josef Gassen, Dusseldorf-Oberkassel, Germany, assignor to Schloemann Aktiengesellschaft, Dusseldorf, Germany, a corporation of Germany.

In the manufacture of wire coils this inventor proposes the method of quenching the wire by directing jets of a cooling liquid from points within a coil of wire outwardly against the inner side of the coil and simultaneously rotating the coil rapidly in its own plane to increase the coil penetrating effect of the liquid.

✦ ✦ ✦

No. 2,021,238, MATTRESS AND HANDLE THEREFOR, Patented November 19, 1935 by Charles D. Karr, Holland, Michigan.

For a spiral spring mattress this inventor provides a handle in loop form having ends projecting inwardly thru the boxing and attached to intermediate turns of the pair of the spirals.

✦ ✦ ✦

No. 2,021,405, SPRING STRUCTURE, Patented November 19, 1935 by William A. Clark, Detroit, Mich, assignor to L. A. Young Spring and Wire Corporation, Detroit, Mich.

More specifically, it is stated that this spring structure is adapted for heavy duty, such as in seats for trucks, busses and the like, altho the structure is light weight.

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No. 2,021,430, SPRING STRUCTURE, Patented November 19, 1935 by Cornelius E. Platt, Windsor, Ontario, Canada, assignor to L. A. Young Spring and Wire Corporation, Detroit, Mich.

A box spring structure is provided in which the springs are entirely enclosed as a protection against dust and the like but the boxing may be easily opened in order for inspection.

✦ ✦ ✦

No. 2,021,528, SPRING ASSEMBLY FOR UPHOLSTERY AND SPRINGS THEREFOR, Patented November 19, 1935 by Louis A. Suekoff, Wilmette, Ill.

The terminal coils of this spring assembly are extended at their extremities laterally beyond the body of the spring, the extremity being provided with skeleton terminal formation, such as loops, which are so secured that the springs will not rotate about their own axes.

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No. 2,021,704, SCREW, Patented November 19, 1935 by Everett A. Thatcher, Winnetka, and Joseph F. Fieg, La Grange, Ill., assignors to United Screw and Bolt Corporation, Chicago, Ill., a corporation of Ohio.

This screw is of the type which is adapted to form its own threads in metal, the body of the screw being threaded with a single continuous uninterrupted thread throughout substantially its entire length, the crest diameters of a number of the convolutions at the entering end of the screw being flat and equal to each other in diameter but of smaller diameter than the crest diameters of the convolutions upon the remainder of the screw. The convolutions at the entering end of the screw are inclined towards that end.

✦ ✦ ✦

No. 2,022,225, WIRE WEAVING MACHINE AND METHOD OF WEAVING WIRE CLOTH, Patented November 26, 1935 by Herbert L. Thompson, Elgin, Ill., assignor to Reynolds Wire Co., Dixon, Ill., a corporation.

A brake-controlled warp wire supplying device is provided with feeding means for drawing the woven fabric upwardly through part of the machine. The construction also includes horizontally operating heddles for forming a warp shed, a shuttle being operated across the heddles within the warp shed for supplying the weft wire for the weaving within the warp shed.

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'Round the World With the Wire Industry

Possible Formation of an International Bolt and Screw Cartel

WHILE nothing definite has been learned, it is understood that "feelers" have been put out with a view to the possible establishment of an **international** bolt and screw cartel which, it is hoped, would embrace German, French, Swedish, American and British manufacturers, according to the October 22, 1935 issue of the Deutsche Bergwerkszeitung. It is stated further that this agitation has been started by the British Screw and Rivet Association and that in the event of such a formation, the syndicate would not deal with wood screws.

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Tube Fittings Cartel Formed

INCLUDING manufacturers in Great Britain, the United States, Germany, Canada, Switzerland, Austria, Italy, Spain and Czechoslovakia, the **International** Malleable Tube Fittings Association was formed at Dusseldorf, Germany, during October. The objects of the Cartel are stated to be the international regulation of prices for tube fittings, and the fixation of quotas for certain of the countries which are members, in the hope that the general international level of prices will be raised. Negotiations with Belgian and Yugoslav producers are still in progress; however, it is stated that Japanese manufacturers have definitely refused an invitation to join.

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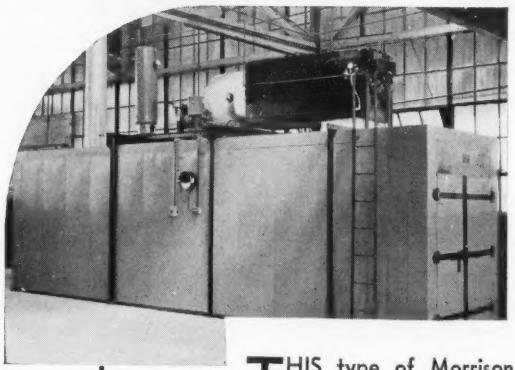
French Comptoir for Strip Iron

THE French Comptoir for strip iron, rolled cold, follows with very great interest the negotiations for the renewal of the Comptoir Siderurgique. The life of the strip Comptoir does not end until the beginning of 1936, but it appears certain, it is stated, that decisions made by the Comptoir Siderurgique are likely to influence measures for renewal of the strip Comptoir.

Chromal, A Substitute for Nichrome

THE new alloy "Chromal", manufactured for the first time in the **Soviet Union**, consists of 30 percent chrome, 5 percent aluminum, and 65 percent iron, according to the Sowjetwirtschaft u. Aussenhandel, No. 18 (1935), an official publication of the Soviet Government. The outstanding qualities of chromal—which is made of domestic raw materials—will, it is stated, contribute greatly to its general use and to its utilization as a substitute for nichrome, which is a dificiatary commodity in the U. S. S. R.

NEW ROD BAKER
Yields Savings up to 50%



MORRISON ENGINEERED

THIS type of Morrison rod baking unit is turning back savings to its owners that frequently amount to 50% of former production costs. It is easy to see how this is possible when one realizes that tonnage can be doubled without increasing present fuel consumption. The output comes in perfect condition for all drawing operations because of the exact heat and atmosphere control accomplished by the revolutionary Morrison recirculating convection heater. May we demonstrate to you how Morrison rod baking equipment can readily pay for itself through savings, as it has already done in many of the country's leading mills.

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5005 EUCLID AVE. CLEVELAND, OHIO

'Round the World With the Wire Industry

Hoop Iron Orders Placed in Japan by Soviet Russia

IT is reported that total orders for hoop iron by Soviet Russia from **Japan** during the initial 9-month period of this year have aggregated 1,200 metric tons. A number of inquiries, it is stated, have recently been received in Japan from Australia and it is expected that exports to that market will commence in the near future. This indicates the rapid progress made in the Japanese manufacture of this item, which was not produced in that country prior to 1935. Despite the development of the domestic industry, some sizes and types are not produced and imports during the first nine months have aggregated 46,153 metric tons, representing a drop of only 25% when compared with the corresponding period of last year.

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Japan Steel Tubing Company to Erect Plant for Special Steel Manufacture

THE Department of Commerce and Industry has given permission to the **Japan** Steel Tubing Company to erect a plant at Fushiki in Toyama Prefecture for the manufacture of special steel, and it is expected that operations will commence during 1936, with an annual capacity of 25,000 metric tons. A new type electro-furnace is being erected at the Yawata plant of the Japan Steel Company for the production of specific steel, to be in operation by September, 1936. The authorities of the Yawata plant are speeding up the construction of two new flat furnaces with a daily capacity of 60 metric tons, to be completed by the end of September, 1936. The Yawata plant of the Japan Steel Company during September, had a production amounting to 130,351 tons of steel materials, representing a gain of 19,335 tons over August. Production during the initial 9-month period of this year was 744,009 tons. September production of tin plate was 7,084 tons, bringing the total for the nine months of 1935 to 40,520 tons.

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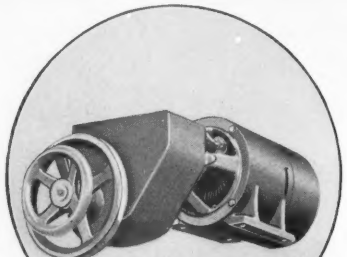
Brisk German Business in Steel Wire

WHILE seasonal reasons have curbed the demand for ordinary wire for fencing and other outdoor uses, it is reported that an upward trend has become evident for high quality steel wires for special uses, according to the October 18 issue of Frankfurter Zeitung. In this connection particular mention is made of steel wire for wire rope, spiral spring wire, saddle spring wire, mattress and bed spring wire, cable wire and similar products. Consumers and dealers are showing a tendency to maintain stocks of products which are in ready demand.

Why . . .



Syncro Insulating Machines

Maintain uniform coverage at high speeds with web and strand insulations.

SYNCRO Flyers and Capstans are individually driven by direct connected synchronized motors. Therefore the flyer and capstan of each Syncro machine remains in perfect synchronism at all speeds.

SYNCRO'S perfect timing eliminates waste due to skips and excessive overlaps caused directly by drive slippage.

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'Round the World With the Wire Industry

Arrangement Between Greece and Germany for the Supply of Wire Rods

CONSIDERABLE anxiety has been aroused among German wire rod exporters in connection with the introduction of American wire rods into the **Greek** wire manufacturing industry during the past two years. For a number of years the German product enjoyed a practical monopoly in the Greek market and, in an effort to regain the former position, the so-called "Entente International du Fil Machine"—said to be controlled chiefly by German wire rod interests—recently approached all wire manufacturers in Greece offering to supply their full requirements for a specified period at a price fixed in advance. Those producers were reluctant to enter into such an agreement, not wishing to purchase at given prices over a long period, and because they had found the American wire rods in certain respects were better adaptable to their needs. The difficulty of obtaining import permits for American wire rods in sufficient quantities coupled with the absence of any restrictions in imports from Germany, however, caused all but one manufacturer to enter into an agreement with the German cartel covering their full requirements until the close of 1936.

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IT is not believed that this agreement will have any material effect on American wire rod exports to Greece as the concern not signatory to the agreement—and which states that it will continue to purchase its requirements from the United States—requires about 2,000 tons of wire rods annually. It is pointed out that if permits for 2,000 tons of American wire rods are granted by the Greek exchange authorities, American exporters will have secured from Greece a much larger share of the business than it has been possible for them to secure since this product was first introduced into Greece. If eventually the firm in question should become a party to the agreement, the American product would find no market in Greece, particularly since the installation of new wire plants is prohibited by existing regulations.

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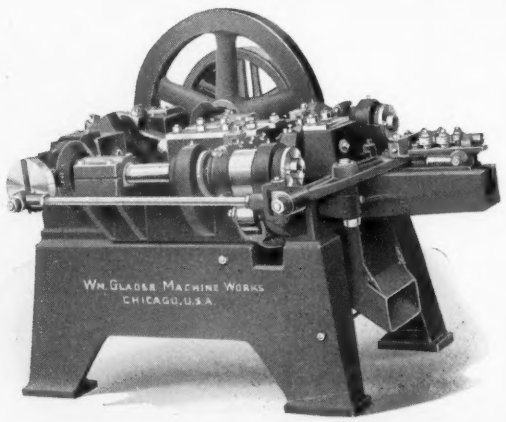
Plan to Increase Japanese Wire Rod Production

THE Yawata plant of the **Japan** Steel Company plans to erect an additional wire rod mill with an annual capacity of 120,000 metric tons in order to prevent importation of such goods. This plan is still tentative and is subject to approval by the Department of Commerce and Industry. Present production of wire rods in Japan is at the rate of about 260,000 metric tons per year, of which the above company produces 120,000 tons.

GLADER

HIGH SPEED WIRE NAIL MACHINE



Machines are built in nine sizes to cover the most exacting requirements.

Our aim in the design of these machines has been for sturdy construction and long life. Main frame is of cast-steel, as well as most of the other working parts, and in those parts subject to the greatest wear and shock, we use an alloy steel that has been determined through years of experiment and mill service.

The performance of these machines, both as to production and low maintenance cost, has led to their exclusive selection in all of the recent major nail making machine installations.

Wm. Glader Machine Works

210 N. Racine Ave., Chicago, Illinois

'Round the World With the Wire Industry

German Notes

THE demand for iron and steel wire products on the export markets is at present very satisfactory. The recent advance of the IWECO quotations by 10 shillings for wires and 15 shillings for wire nails has animated the demand further. Prices for wire netting have also been advanced approximately 10% since September. The demand is satisfactory from all markets and shipment dates have been further extended. For example, it is difficult to get barbed wire before February; wire nails are quoted for February or March shipments. For prompt shipments, extras up to five shillings per ton are asked and paid. The Far Eastern, Indian and South African markets are particularly busy. The wire netting demand is most pronounced from South Africa, Brazil, and the Near East. It is anticipated that the improvement on the export market will be fully maintained.

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THE price lists for wire netting and the list of extras for all wire products have been further revised and simplified. The new lists contain only general rebates and discounts and the extras have been reduced by elimination of 25 to 30% of all items.

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THE bolt, nut, screw and rivet makers report very heavy export turnovers. The export figures during the first ten months of this year are 100 to 120% better than last year. The bolt, nut and rivet industry is operating at approximately 72 to 74% capacity. The wire industry has increased operations 65 to 68% in October to 71 to 73% in November. The demand for wire rods is heavy, and it is probable that the demand will continue for some time. The wire rope industry reports that export turnovers show a further improvement by 12 to 15%.

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NEGOTIATIONS with the British wire industry as to an agreement similar to the wire netting agreements were not continued this month. The continental industry is not going to continue the negotiations unless the British wire industry will be united in a cartel, which would include all manufacturers with a central office, which could represent the whole industry. The present organizations have no power to represent the British industry.

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THE demand for wire products from the United States continues heavy for wire nails and barbed wire, the German industry supplying nearly half of all orders. Wires, wire ropes and strand wire, however, are selling at present in slightly reduced quantities.

A NEW TYPE OF WIRE COVERING MACHINE!!

HIGH SPEED INSULATING WITH PAPER, COTTON AND OTHER MATERIALS

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LOW OPERATING COSTS

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MEDIUM PRICE

F. D. SAYLOR & SON

13095A Greeley Avenue DETROIT, MICH.

'Round the World With the Wire Industry

THE Japanese industry continues to hold back with business on all markets, except Manchuko, etc. In India, Siam, Dutch East Indies, etc., the IWECO is soliciting orders, whereas Japan is selling less. In September Japan's export of wire nails to India reached only 27% of the quantity shipped in 1934. In nonferrous metal wire, particularly brass and copper wire, Japanese turnovers show a rising tendency, also in the Near East, Egypt and Italy. Japan is shipping bars and copper wire to Italy, being a non-League of Nations country, sanctions do not concern this business.

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Cleveland Industrial Exposition

THE romance of the iron and steel industry will be the central theme of a great three-month industrial exposition to be held in 1936 at Cleveland, Ohio, during July, August and September. The event will celebrate the centennial year of the city and is expected to draw large exhibits from industry in the Great Lakes region.

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MEN prominent in the steel and allied industries who are on the exposition organization committee include T. M. Girdler, Republic Steel Corporation; E. J. Kulas, Otis Steel Co.; H. G. Dalton, Youngstown Sheet & Tube Co.; Fred H. Chapin, National Acme Co.; Elton Hoyt II, Pickands-Mather Co.; L. W. Greve, Cleveland Pneumatic Tool Co.; M. J. Van Sweringen and Alva Bradley.

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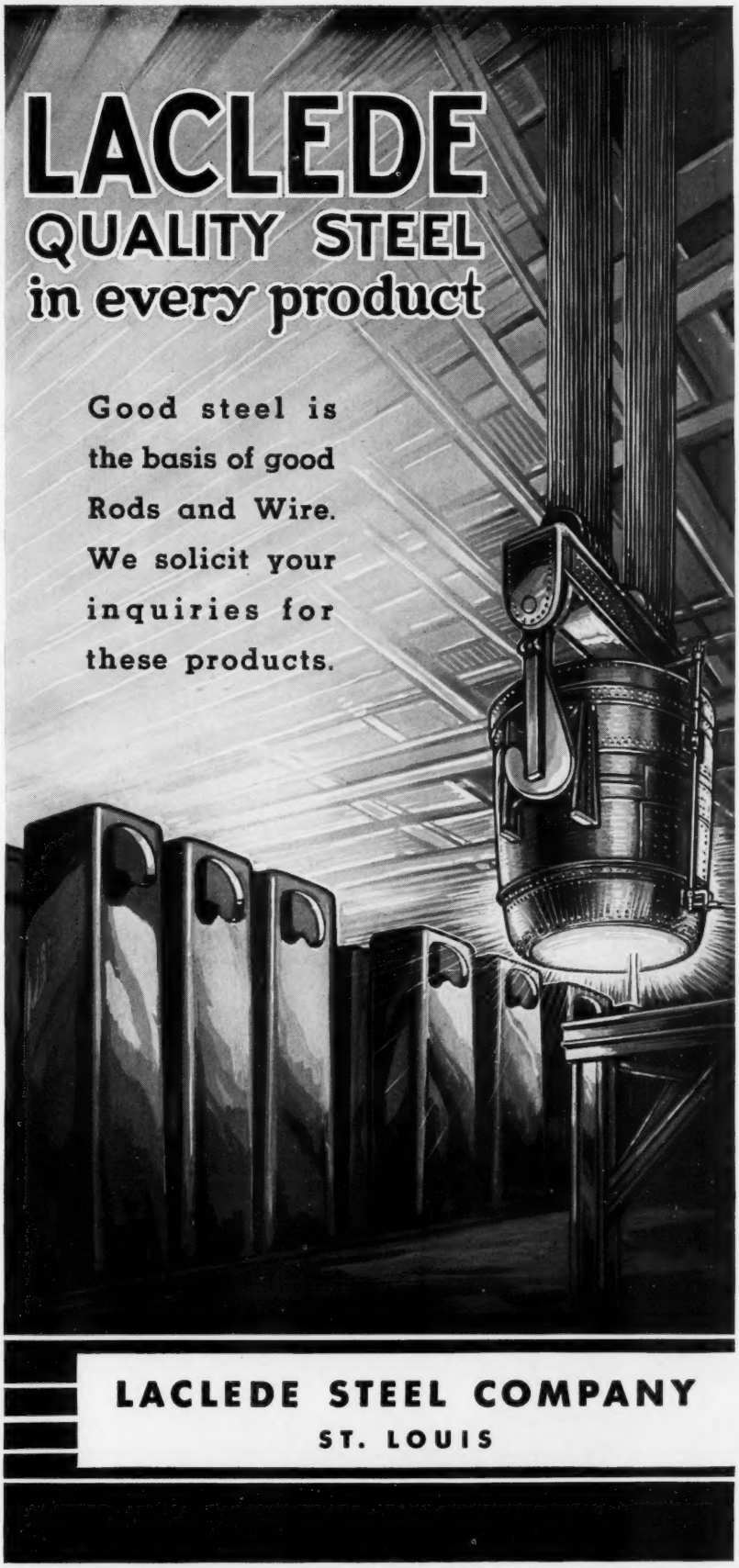
THE exposition, the largest civic event in the history of Cleveland, will be staged on eighty acres of downtown Cleveland lakefront. The huge Public Hall and Underground Exposition Hall and the Municipal Stadium will also be used.

✦ ✦ ✦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Synopses of papers presented before the 27th Annual Autumn Meeting of the Institute of Metals of Great Britain held at Newcastle-on-Tyne, Sept. 12, 1935.

Paper (698) on "Note on the Effect of Interrupted Straining on the Elongation of Lead", by J. C. Chaston, B.Sc., A. R. S. M., Member, (Metallurgist, Standard Telephones & Cables, Ltd., North Woolwich).

✦ ✦ ✦

IT has been found that by interrupting a tensile test on commercially pure lead at intervals, during which the specimen is allowed to rest for a short time free from stress, abnormally high values of elongation are produced. These may be as much as five times those obtained in a normal tensile test. The influence on the elongation of the duration of the rest period, the rate of straining, the amount of elongation between successive rest periods, and the grain-size have been studied by tests on extruded cable-sheath samples. Abnormal elongations are not produced by interrupted straining on "hardened" lead alloys at room temperature, but it is suggested that such effects may be obtained in these and any other metals and alloys if they are tested above their recrystallization temperatures. The observations recorded may thus have a bearing in connection with high temperature metallurgical research.

✦ ✦ ✦

Paper (702) on "Corrosion Below Discontinuous Oxide Coatings, With Special Reference to Magnesium", by K. G. Lewis, M. Sc., Member, (The University Chemical Laboratories, Cambridge), and U. R. Evans, M. A., Sc. D., Member, (The University Chemical Laboratories, Cambridge).

✦ ✦ ✦

PROTECTIVE processes fall into two classes: (a) safe processes, where even incomplete treatment lengthens the time of perforation; (b) dangerous processes, where inadequate treatment intensifies attack and brings quicker perforation than no treatment.

✦ ✦ ✦

MAGNESIUM, uncoated and coated with oxide layers produced by three different treat-

ments applied for numerous different periods, has been subjected to sodium chloride in a new circulating apparatus. Time-corrosion curves and perforation periods have been obtained. The data show that these processes belong to the "safe" class.

✦ ✦ ✦

Paper (709) on "The Protection of Magnesium Alloys Against Corrosion", by H. Sutton, M. Sc., Member, (Senior Scientific Officer & Head of the Metallurgical Dept., Royal Aircraft Establishment, South Farnborough) and L. F. Le Brocq, B. Sc., (Scientific Establishment, Royal Aircraft Establishment, South Farnborough).

✦ ✦ ✦

SHORT-TIME chromate treatments of magnesium-rich alloys of two types in common use have been investigated, and the protective value of the treatments has been compared with the 6-hr. chromate treatment and other forms of protective treatment.

✦ ✦ ✦

A BATH has been evolved capable of giving good films in 30-45 minutes, and which is suitable for use in steel or aluminum tanks.

✦ ✦ ✦

THE protective value of the 6-hr. and short-time chromate treatments, with and without supplementary coatings of varnishes and enamels, has been investigated with reference to typical alloys. Intermittent sea-water spray laboratory tests and beach exposure tests were carried out, and the corrosion which occurred was observed by loss of weight and change in mechanical properties.

✦ ✦ ✦

EXPERIMENTS were carried out on the influence of cleaning treatments employed before chromate treatment.

✦ ✦ ✦

Paper (705) on "The Inter-Relation of Age-Hardening and Creep Performance. Part I.-The Age-Hardening of Nickel-Silicon Copper Alloys", by C. H. M. Jenkins, D. Sc., A. R. S. M., Member, (Senior Scientific Officer, Dept. of Metallurgy and Metallurgical Chemistry, National Physical Laboratory, Teddington), and E. H. Bucknall, M. Sc., Member, (Scientific Officer, Dept. of Metallurgy and Metallurgical Chemis-

(*Please turn to page 42*)

Scott Wire Testers

Operate on the dead weight principle and are:

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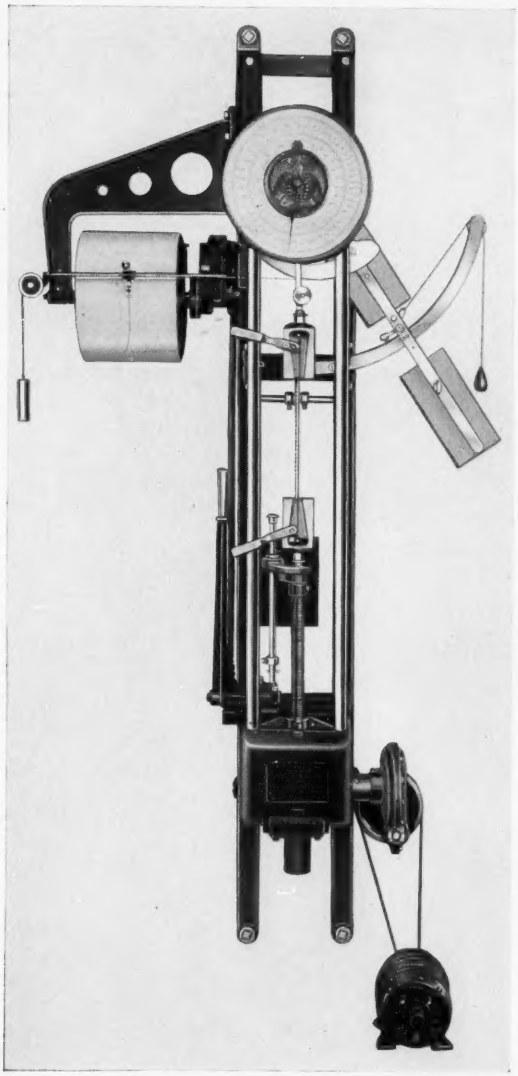

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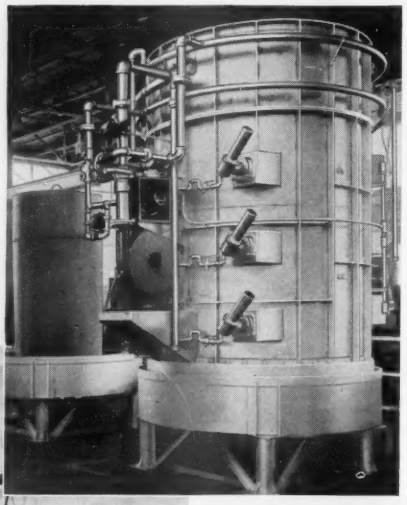
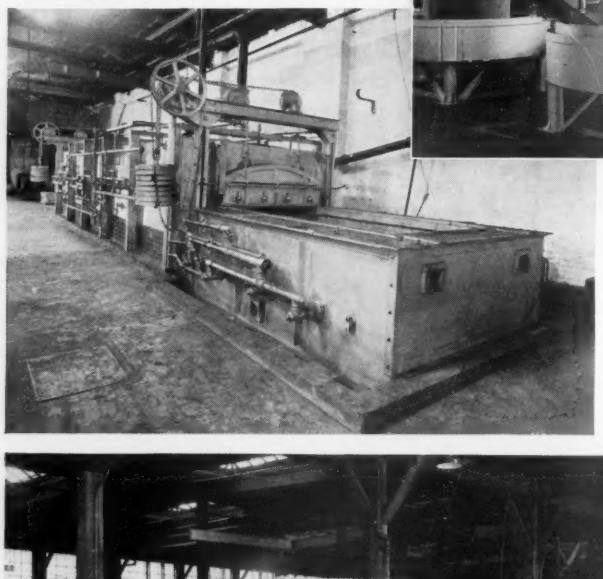
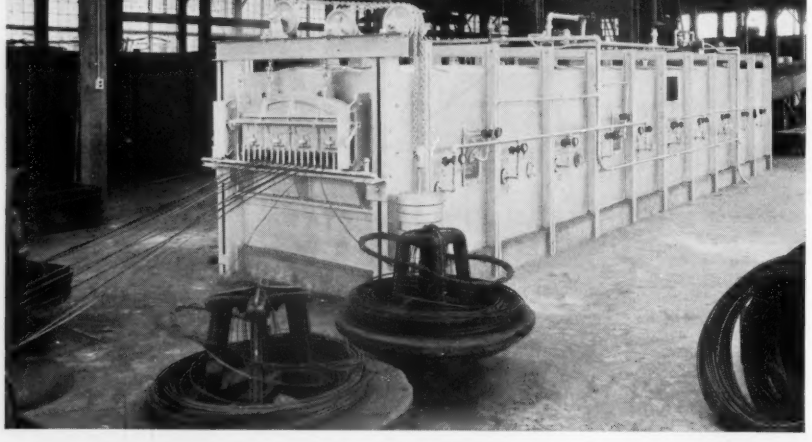




Above: Bell Type Annealing Cover.

Left: Wire Patenting Furnace.

Below: Charge End, Wire Patenting Furnace.



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Digest of British Research Papers

(*Continued from page 41*)

try, National Physical Laboratory, Teddington).

With an Appendix on "The Relationship of Time, Temperature, and Concentration as Factors in Age-Hardening," by E. H. Bucknall, M. Sc., and C. H. M. Jenkins, D. Sc., A. R. S. M.

✦ ✦ ✦

A REPORT is given of an investigation on the age-hardening of nickel-silicon-copper alloys containing 3 and 5 per cent nickel + silicon in the atomic ratio 2 Ni: 1 Si. This work, which was carried out as a preliminary to the study of the inter-relation of the age-hardening of this material and its creep performance, has provided sufficient information to serve as a basis for the creep test programme and to assist in the interpretation of the creep results.

✦ ✦ ✦

THE alloy containing 3 per cent. nickel + silicon when quenched from 900°C. undergoes age-hardening at temperatures of 300°-750°C. The maximum hardness is attained progressively more rapidly the higher the ageing temperature, being reached for example, in more than 64 days at 400°C. and in less than 1 minute at 700°C. In general, a linear relationship appears to apply between the logarithm of the time and the reciprocal of the absolute temperature of attainment of maximum hardness. The maximum hardness is greater the lower the ageing temperature. The attainment of maximum hardness is generally followed by softening.

✦ ✦ ✦

MICROSCOPICAL and chemical evidence of the progress of ageing has been obtained, but X-ray study has not been of great assistance in this instance.

✦ ✦ ✦

IN the Appendix consideration is given to points relating to the age-hardening of nickel-silicon-copper alloys and their comparison with information in the literature relating to other age-hardenable alloys. Particular attention is directed to the importance of the relationship between temperature and time of attainment of maximum hardness, which is shown to

be of general application. A similar relationship applies to the attainment of maximum resistivity during ageing. These relationships are regarded as confirming the commonly accepted theory of age-hardening.

✦ ✦ ✦

Paper (712) on "An Investigation of the Nature of Creep Under Stresses Produced by Pure Flexure", by H. J. Tapsell, A. C. G. I., Member, (Senior Scientific Officer, Engineering Department, National Physical Laboratory, Teddington), and A. E. Johnson, M. Sc., (Scientific Officer Engineering Department, National Physical Laboratory, Teddington).

✦ ✦ ✦

THE paper deals with the results obtained in a study of the stresses and strains arising when a material is subjected to bending moments in conditions which produce creep. For experimental reasons, it was necessary to use a material which would creep at air temperature, and for this reason lead of commercial purity was chosen. Apparatus was constructed by which a beam of lead was subjected to uniform bending moment, and measurements of the creep of the beam were recorded. The whole equipment was housed in a chamber maintained at constant temperature. Tensile creep tests on the material of the beam were also carried out at constant temperature in order to provide stress-strain data for the calculation of the stresses in the beam.

The investigation led to the following conclusions: (1) in the case of a lead beam creeping under stresses produced by pure flexure, plane sections continue to remain plane; (2) the redistribution of stress arising from creep is complete within one-fifth of an hour after application of a bending moment, and the stresses continue unaltered with time; (3) the behaviour of the beam under flexure may be fairly computed solely from the relations between tensile stress and rate of strain, corresponding to any period of tensile creep testing on the material of the beam.

✦ ✦ ✦

Paper (711) on "Alloys of Magnesium. Part III.—Constitution of the Magnesium—Rich Alloys Containing Aluminium

(*Please turn to page 44*)

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A case so hard that it defies file and hacksaw combined with a core tough enough to hang on through twisting torture makes "Konik" the ideal steel for locks. It works readily, stands extreme deformations, machines well, cuts fabrication cost. In solid, liquid, or gaseous carburizing mediums, as best suits your job, "Konik" takes a deeper, quicker case.

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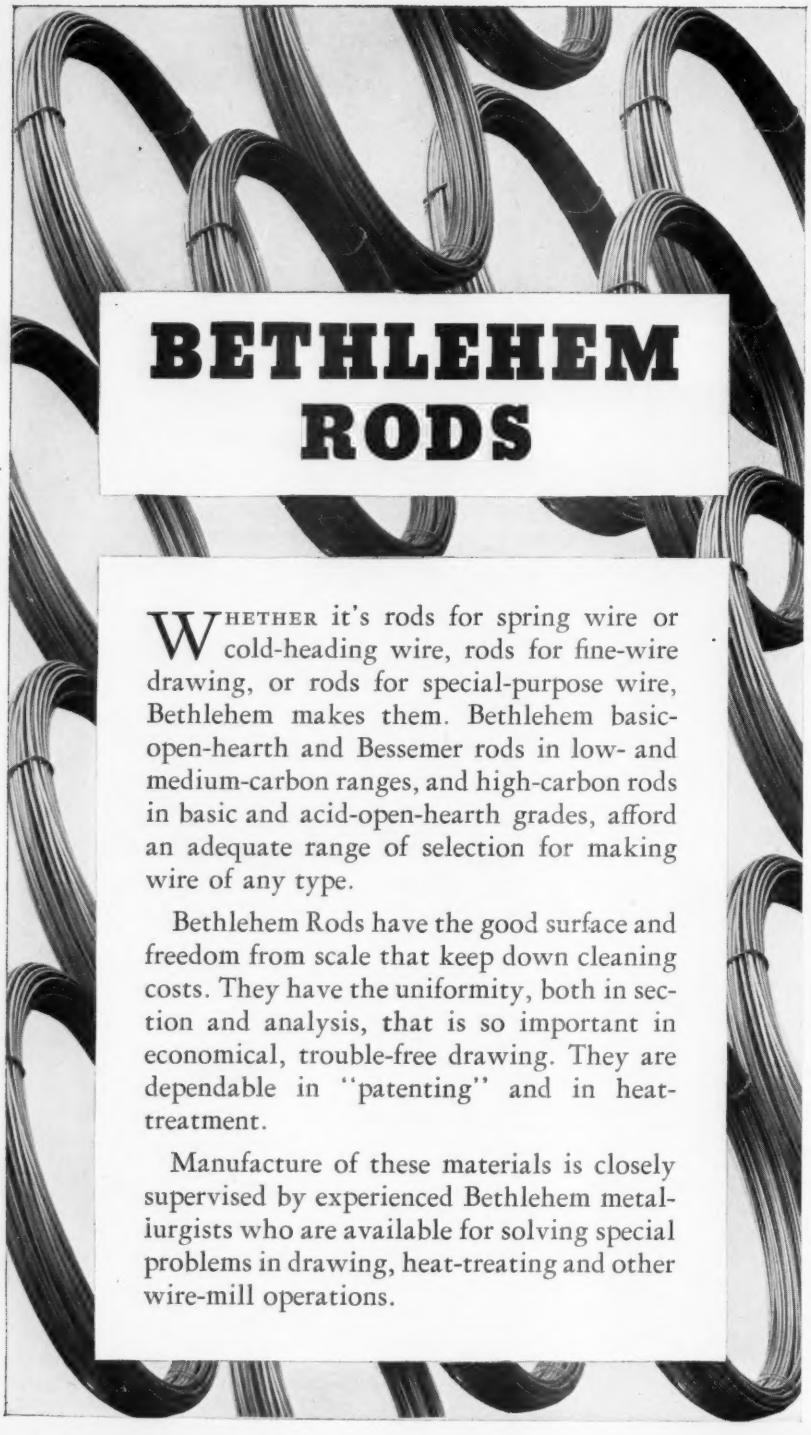
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WHETHER it's rods for spring wire or cold-heading wire, rods for fine-wire drawing, or rods for special-purpose wire, Bethlehem makes them. Bethlehem basic-open-hearth and Bessemer rods in low- and medium-carbon ranges, and high-carbon rods in basic and acid-open-hearth grades, afford an adequate range of selection for making wire of any type.
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Digest of British Research Papers

(*Continued from page 43*)

and Cadmium", by Dr. J. L. Haughton, D. Sc., Member of Council, (Principal Scientific Officer, Dept. of Metallurgy and Metallurgical Chemistry, National Physical Laboratory, Teddington) and R. J. M. Payne, B. Sc., Member, (Assistant III, Dept. of Metallurgy & Metallurgical Chemistry, National Physical Chemistry, Teddington).

\+ + +

THE addition of cadmium to magnesium-aluminium alloys depresses the liquidus slightly, 20 per cent. cadmium lowering the liquidus temperature of an 80 per cent. magnesium—20 per cent. aluminium alloys by about 50°C., but has practically no effect at the temperature of the aluminium-magnesium eutectic. It also reduces the solubility of aluminium in magnesium to a small extent. No new phases are found up to 20 per cent of each added element, but attention is directed to an abnormal form of precipitation which was found in some of the alloys.

\+ + +

Paper (699) on X-Ray Study of Copper-Silver Alloys", by Professor E. A. Owen, M. A., D.Sc., Member, (Professor of Physics, University College of North Wales, Bangor) and Joseph Rogers, Ph. D., (University College of North Wales, Bangor).

\+ + +

THE phase boundaries in the thermal diagram of copper-silver alloys have been determined by the X-ray method. A general survey showed that the phase fields were the same as those in the generally accepted diagram of the system. More detailed investigation with the precision X-ray camera yielded accurate values of the solubilities of copper and silver in each other. These values are compared with the more recently determined values, with which they are found to be in fair agreement. The solubilities of copper in silver and of silver in copper at 778°C. are found, respectively, to be 8.5 and 8.4 per cent. These solubilities decrease to 1.8 and 1.4 per cent at 500°C., and to 0.2 and 0.1 per cent. at 200°C. The extrapolated experimental curves indicate that the one metal

is almost insoluble in the other at room temperature.

✦ ✦ ✦

Paper (706) "The Determination of Certain Phase Boundaries in the Silver-Zinc Thermal Diagram by X-Ray Analysis", by Professor E. A. Owen, M. A., D. Sc., Member, (Professor of Physics, University College of North Wales, Bangor) and I. G. Edmunds, M. Sc., (University College of North Wales, Bangor).

✦ ✦ ✦

THE phase boundaries in the region extending from the γ— to the ε-phase of the silver zinc thermal diagram, have been determined by X-ray analysis. The crystal parameters are accurate in general to 1 part in 5000; in some of the determinations the accuracy is much higher than this. The results confirm the existence of the phase fields contained in the generally accepted diagram of the system, but they indicate that the positions of the boundaries need readjustment. The (γ) — $(\gamma + \delta)$ boundary requires adjustment in the direction of lower silver content, by about 0.5 per cent. silver by weight at the lower temperatures, and by a progressively greater amount in the opposite direction as the temperature is increased. The $(\gamma + \delta)$—(δ) boundary needs to be displaced towards the silver end of the diagram through about 4 per cent. in composition, thus reducing the width of the $(\gamma+\delta)$ region to about half its former value. The (δ)—$(\delta + \varepsilon)$ and (δ) — $(\delta + \eta)$ boundaries are more nearly parallel to the temperature axis than those shown in the thermal diagram published in the International Critical Tables. At the higher temperatures the (δ) — $(\delta + \eta)$ boundary moves towards the silver end through about 4 per cent. in composition. The $(\delta + \varepsilon)$ — (ε) boundary is parallel to that in the accepted diagram, but needs an adjustment of about 1 per cent. towards the silver end of the diagram.

✦ ✦ ✦

Paper (707) on "Note on the Failure of a Gold Fuse in Contact With Nickel-Chromium Alloy", by M. C. Caplan, B. Sc., (Member), (Member of the Staff of the Research Laboratories of the General Electric Co., Ltd., Wembley).

✦ ✦ ✦

(Please turn to page 46)

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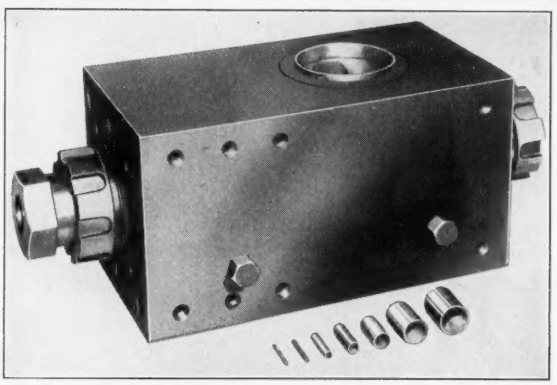
QUICK CHANGE

LEAD ENCASING DIE-BLOCK

Assures

UNIFORMITY



UNIFORM Temperature for all diameters

UNIFORM Lead Flow

UNIFORM Lead Wall

UNIFORM Press Stop Marks

The Die-block illustrated has a range of from ¼" to 2" inside diameter lead sheath. With it, dies and cores can be changed in ten minutes, without melting any lead out of the die block . . . saving materially in time and consequent production cost.

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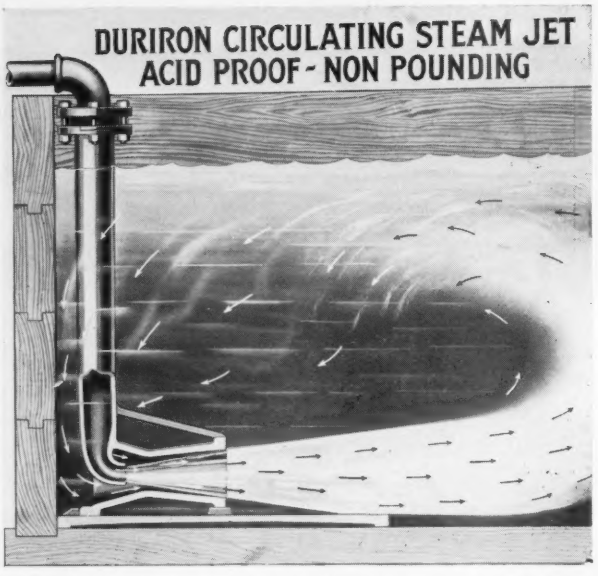

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Digest of British Research Papers

(*Continued from page 45*)

THE failure of a gold safety fuse to operate at the correct temperature was found to be due to diffusion taking place between the gold link and the nickel-chromium connections at temperatures of 950°-1000°C. An alloy of lower melting point is formed which offers little resistance to oxidation, and finally the gold link becomes disintegrated and converted into a cindery residue.

✦ ✦ ✦

Paper (708) on "Production of Powdered Alloys of Low Melting Point", by R. W. Rees, B Sc., Member, (Research Laboratories, General Electric Co. Ltd., Wembley).

✦ ✦ ✦

A METHOD is described for producing lead-base alloys in the form of powder. For this purpose advantage is taken of the pasty stage through which the alloys pass during solidification.

✦ ✦ ✦

Paper (713) on "Note on the Tarnishing of Liquid Metals as Studied by X-Rays", by Hugh O'Neill, D. Sc., M. Met., Member, (L. M. S. Research Laboratory, Derby; formerly Senior Lecturer, Dept. of Metallurgy, The University, Manchester) and G. S. Farnham Ph. D., B. A., Member, (Metallurgist, Ontario Research Council, Toronto; formerly Research Metallurgist, The University, Manchester).

✦ ✦ ✦

AN apparatus has been constructed for the X-ray study of liquid metals up to 700°C. by surface reflection. Spectrograms taken with Cu X-radiation in an atmosphere of hydrogen just above the melting point of lead, tin, and SnSb showed the structure of surface tarnish films. Preferred orientation effects were observed. On heating to higher temperatures the tarnish was reduced in thickness, and the Debye ring of the liquid metal replaced the X-ray spectrum of the tarnish.

STEEL WIRE
By Maurice Bonzel
PRICE $15.00
WIRE & WIRE PRODUCTS
17 E. 42nd St., New York, N. Y.

Cable Developments in 1935

By John Liston

General Electric Company
Schenectady, N. Y.

IN the field of paper cable, investigations are being continually made to improve the quality of the insulation and of the lead sheath, to reduce losses, and to turn out a cable which represents an improvement on previous designs even though these designs may have been excellent. During the year such developments resulted in the compact strand, in superdense paper for insulation, and further improvements in the hydrogen lead sheath process.

✦ ✦ ✦

Compact Strand Construction

THE compact strand construction reduces the overall diameter and weight of the completed cable; reduces the alternating-current resistance and reduces stress concentration at the conductor surface.

✦ ✦ ✦

Superdense Paper

THE use of superdense paper near the conductor improves both the mechanical and dielectric strength of the cable. By using superdense paper near the conductor and a paper of lower density near the sheath a grading effect is obtained which results in more uniform stress distribution.

✦ ✦ ✦

Hydrogen Lead Process

THE improved hydrogen lead process is now in regular commercial production and should go far toward solving the problem of homogeneity in the lead sheath and of the elimination of oxide occlusions and poor welds which have caused sheath troubles in the past.

✦ ✦ ✦

All-Tellurium Cable

IN the field of rubber cable an all-tellurium cable is now available in which the insulation and jacket are extruded in one operation. Another type includes a braid under the outer jacket.

✦ ✦ ✦

Shielded Rubber X-Ray Cable

A 50-kv direct-current shielded rubber X-ray cable with cor-

(*Please turn to page 50*)

AMERICAN LIME & STONE COMPANY
Bell-Mine Products
WARNER COMPANY—MANAGEMENT

In 1936

Bell-Mine Lime Products will continue to be uniform and pure,—burned in modern rotary kilns from deep-vein limestone unmixed with surface rock,—free from grit,—high in calcium oxide content.

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Bell-Mine Pulverized Lime in actual use has long proven its excellent covering quality and dependable adhesion in wire drawing processes.

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FOR CARBON STEELS ▲ ▲ ▲

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The strong passivating effect of this excellent inhibitor insures a bright finish and forms a sound basis for a bright drawing technique—

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UNDER and OVERSIZE
CALIPER
Can Be Used With
RUBBER COVERED,
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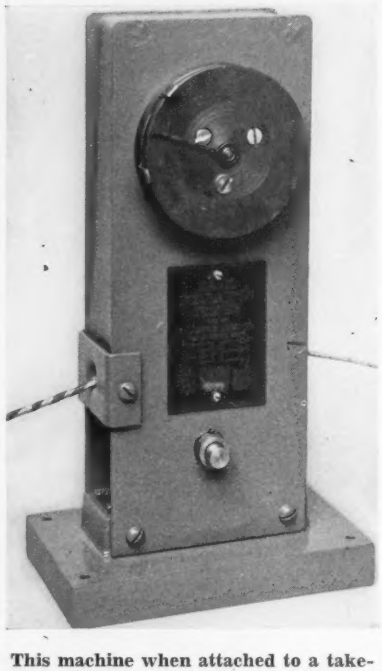


This machine when attached to a take-up will operate an automatic stop when a variation in diameter occurs. The pointer is grounded and the small metal ears attached to the discs are connected to a sparker. When the pointer is moved by a variation in diameter within sparking distance of the ears a spark will jump and stop the take-up. The amount of variation in diameter before the machine will stop can be varied to meet the purchasers requirements.

Used to diameter check wire for Leading or Armoring. Can be attached to continuous Insulating and Vulcanizing Machines to secure automatic check on diameters.

Write For Details

"Davis" Sparkers
"Davis" Automatic
Spark Testing System of Relays and Controls.

R. L. Davis Elec. Co.
340 CENTER ST.
WALLINGFORD
CONN.

The Problem of Retirement of Wire Rope From Service

(*Continued from P. 21*)

FROM the above given figures (Charts) it is easily seen that with a comparatively small decrease in the reserve strength of the wire ropes (about 10-15 per cent. from the initial ultimate strength depending upon the type of the rope) the latter reaches the end for practical use in passing over the sheaves and drums.

✦ ✦ ✦

BESIDES the inspection code for the limits of the life of wire ropes allowing the presence of a definite number of broken wires for a definite length of rope without consideration the construction of the rope is not only insufficient but dangerous.

✦ ✦ ✦

R. WOERNLE'S research once more emphasizes the fact that ordinary test for determination of breaking strength of a rope is insufficient for the estimation of the durability and reliability of the ropes in service, and that it is necessary to subject them to the fatigue test with consideration of their construction.

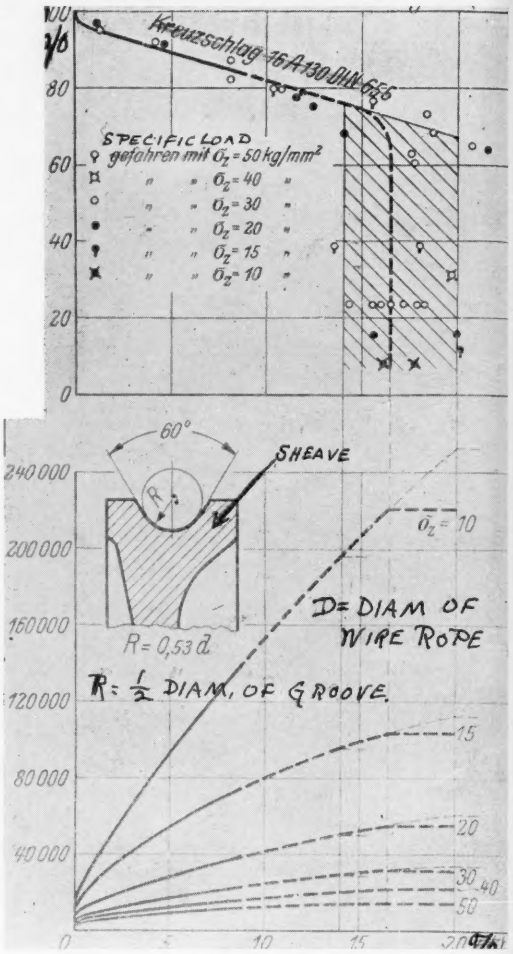


Fig. 5 (upper). Relation between the decrease in reserve (remaining) strength of regular-lay ropes and the degree of deterioration of ropes under the varying specific load of ropes °Z from 10 to 50 kg/mm². Lower curves show the process of deterioration of regular-lay wire ropes of ordinary construction in relation to number of bends over sheaves of 400 mm diameter under the varying specific load of rope °Z from 10 to 50 kg/mm².

✦ ✦ ✦

Optical 6-Curve Lens for Goggles

A NEW goggle lens, having far greater impact resistance than any lens previously used in standard eye-protection equipment, is now being offered by American Optical Company. The new lens, called the 6-Curve Super Armorplate, gets its extra strength from its high curvature, according to a statement issued by the manufacturer. An indication of its superior impact resistance is provided in the account of tests used to determine its strength.

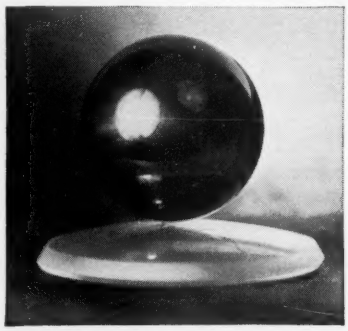
✦ ✦ ✦

A ONE-INCH solid steel ball was dropped on the lens from a height of ten feet. The unretouched, stop-motion photograph reproduced here—taken by Professor H. E. Edgerton of Massachusetts Institute of Technology shows how the camera caught the action. This photograph, said to be the first ever taken of an impact

goggle lens at the moment of impact, required an exposure of only

1/100,000 of a second. The standard test for goggle lenses specifies a ⅝-inch steel ball dropped from a height of 39 inches. A height of three times the government standard, and a weight of four times the standard was used in testing the new 6-Curve Lens; a blow having twelve times the energy of the standard test.

✦ ✦ ✦



One Inch Steel Ball Striking Lens. ✦ ✦

BESIDES its advantages in resisting impact hazards, the 6-Curve Lens is declared to be more effective in deflecting glancing blows, because of its higher curvature; and it is also stated that the curvature permits a closer fitting to the face without interfering with the eyelashes. In the event of fracture by an irresistible blow, tests indicate that the curvature tends to push the fragments out and away from the eye.

✦ ✦ ✦

A New Type of Insulating Machine

(*Continued from page 30*)

system has been proven to be very efficient.

✦ ✦ ✦

THE pay off of the machine varies from 50 feet per minute to 212 feet per minute on wires ranging from No. 14 to No. 25 B & S gauge in the solid wires and to No. 8 in the stranded wires.

✦ ✦ ✦

A DOUBLE flyer machine has been designed for applying two raps of insulation during one continuous passage of the wire. This machine, however, is essentially the same in principle as is the single head machine and, therefore, calls for no further comment in this article.

✦ ✦ ✦

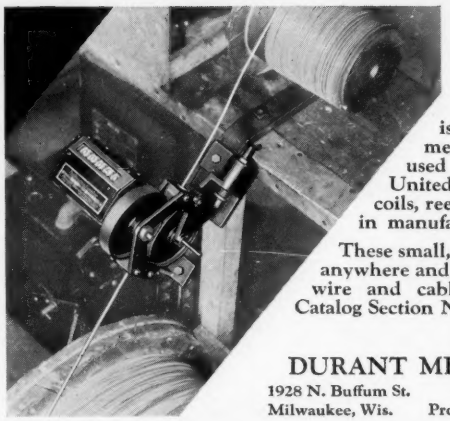
EACH **"Syncro"** spindle is a self-contained unit, mounted on an individual base and provided with a built-in independent electric control panel. The complete flexibility of this design is a real advantage, for a bank of spindles can be increased one or more units at a time to meet production requirements, or spindles can be moved from one bank to another to suit changing conditions.

✦ ✦ ✦

SYNCRO machines can be equipped with reel lifters for placing Supply and Take-Up reels in position and for demounting them. These reel lifters go far in protecting the operator when handling heavy reels as well as protecting the reels and the wire itself from damage.

✦ ✦ ✦

OTHER machines which incorporate the principles of this unit are being designed and planned by Syncro engineers. There are many operations which require a more precise and flexible machine now and as we progress this need will grow.



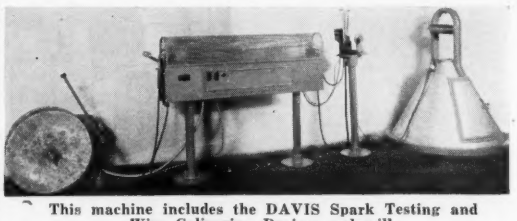
THE ONLY WAY TO MEASURE WIRE ACCURATELY

is to run it through a dependable wire measuring machine. *Productimeters* are used in most of the wire plants of the United States for getting accurate footage on coils, reels, and spools, measuring off wire, and in manufacturing wire products.

These small, compact machines can be mounted anywhere and are adapted to bare or insulated wire and cable .005 to .5 in. Send for Catalog Section No. 6.

DURANT MFG. CO.
1928 N. Buffum St. Milwaukee, Wis.
180 Eddy St. Providence, R. I.

Productimeters
THE SPEEDOMETERS OF INDUSTRY



This machine includes the DAVIS Spark Testing and Wire Calipering Devices and will
1—Depan rubber covered wire after vulcanization,
2—Stop automatically if wire tangles when leaving pan,
3—Measure total length of wire and, if desired, stop on reaching any predetermined length as measured by an auxiliary dial,
4—Check diameter of covered wire for over or under size insulation, stopping automatically in either case,
5—Spark test rubber insulation for faults,
6—Wind the wire on a reel on a motor driven reel stand.

Automatic depanning, wire measuring, spark testing and reeling outfit—combines many operations — saves time and labor cost.

(Patent applied for)

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Cable Developments in 1935

(*Continued from page 47*)

ona resisting tape and basket weave overall was produced. It was formerly impossible to obtain cable satisfactory for this service in this country.

✦ ✦ ✦

Service Entrance Cable

A NEW service entrance cable has a copper band neutral on the outside, which also serves as an armor. The loom weave braid finish was improved and is now freely used in the moving picture industry.

✦ ✦ ✦

THE development of a free stripping neon sign cable makes it easier to install neon signs and their auxiliary apparatus.

✦ ✦ ✦

Rubber Network Cables

There are now available six different kinds of rubber network cables.

1. **Moisture-resisting rubber finished with tape and weatherproof and flameproof braid.**
2. **Same insulation—60 per cent rubber sheath.**
3. **Same insulation—Glyptal sheath.**
4. **Solid 60 per cent rubber.**
5. **Versatol rubber with Glyptal sheath.**
6. **Solid Glyptal insulation and sheath.**

✦ ✦ ✦

THESE various types of network cable should be sufficient to meet any conceivable condition where a rubber network cable could be used.

✦ ✦ ✦

Performite Compounds

THE complete line of Performite compounds which was developed during the year, includes Code, Intermediate, 30 per cent, 40 per cent, Tempernol, Aquanol and Versatol. Thus, almost any of the rubber compounds available can be furnished either in a standard grade or Performite grade depending on the requirements of the application.

✦ ✦ ✦

Rubber Compounds

A NEW rubber compound to fill requirements previously met with latex, has a higher dielectric strength, insulation resistance and mechanical strength, a lower water absorption rate and much better aging characteristics than latex. It has good qualities with regard to

flame resistance and to free stripping properties. It will have a wide field of usefulness in thin wall insulation of communication and control cables, resulting in a multiconductor cable with small overall diameter.

✦ ✦ ✦

New Relay

IN cable accessories, a new relay gives an indication in the event of excessive or deficient pressure in an oil reservoir when this reservoir is used in connection with an oil filled cable system. The use of this relay, together with the float type relay previously developed, enables an operating company to install a complete alarm system and difficulties such as leaks in the sheath will be discovered before they can cause trouble.

✦ ✦ ✦

Rural Distribution Cables

TO promote reliable service at reasonable cost, eight new types of cable were developed especially for rural distribution. Five are for underground installation, and three are for aerial installation. All are two-conductor and are characterized by an uninsulated conductor, usually concentric, to keep down costs and to provide a substantial factor of safety.

✦ ✦ ✦

Underground Service Cables

FOR underground service, the following types were developed:

Paper leaded, with flat copper tapes and jute armor.
Rubber leaded, with flat copper tapes and jute armor.
Rubber, with parallel secondary conductor and jute armor.
Rubber, with copper wires and jute.
Rubber, with copper wire (no jute).

✦ ✦ ✦

Aerial Service Cables

FOR aerial service, the following types are available:

Paper leaded, two-per-cent tin alloy, with flat copper tapes.
Varnished-cambric, with copper basket-weave armor.
Rubber, with copper basket-weave armor.

✦ ✦ ✦

The last two types are also available with flat copper tape instead of the basket-weave armor.

Link-Belt Issues New Herringbone Gear Reducer Catalog

A NEW 32-page catalog No. 1519 has been completed by Link-Belt Company, Philadelphia, on its line of single, double and triple reduction Herringbone-Gear Speed Reducers for large speed ratios, and heavy and shock loads.

✦ ✦ ✦

PARTICULARLY stressed is the company's "RC" double-reduction reducer, which is made up of a herringbone-gear first reduction unit, and a finished-steel roller chain drive for the second reduction. Numerous example installations are sketched, with definite solutions of actual driving problems, to show the flexibility and relative advantages of this form of double reduction unit.

✦ ✦ ✦

ANOTHER feature of the book is that it rates all reducers on the basis of the recently recommended practice of the American Gear Manufacturers Association, the company, having re-rated its entire line to so conform. Service factors, dimensions, and weights are given.

Premier
TRADE MARK REG. U.S. PAT. OFF.
Diamond Dies

Reduce Rejects
Give Better Finish
Hold To Size Longer
Cast Straight On Block

DRIVER-HARRIS COMPANY
HARRISON · NEW JERSEY

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✦ ✦ ✦

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of the 1935

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To those who attended the meetings and paid the registration fee, copies are available at $2.50 each.

The Wire Association

17 E. 42nd St., New York, N. Y.

Exports and Imports of Wire

(*Continued from page 33*)

maintained the level of the previous month when 59,168 square feet came in. The principal suppliers of this product were Germany, 28,280 square feet, Canada, 13,756 square feet, France, 7,964 square feet, and the Netherlands, 6,451 square feet.

✦ ✦ ✦

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Roll and Rotary Wire Straighteners
THE F. B. SHUSTER CO.
New Haven, Conn.
Straightener Specialists Since 1866

THE trade in **fourdrinier and other paper-making wires** amounted to 63,071 square feet which compared with a total of 64,134 square feet received in September. The suppliers were Germany, 30,685 square feet, Austria, 15,047 square feet, France, 9,980 square feet, Sweden, 7,359 square feet.

✦ ✦ ✦

RECEIPTS of **wire heddles,** 900,000 pieces, were practically at the level of the previous month, 934,000 pieces. This trade was covered by France, 520,000 pieces, Germany, 354,000 pieces, and the United Kingdom, 26,000 pieces.

✦ ✦ ✦

IMPORTS of **wire fencing and netting** galvanized before weaving, 60,000 square feet, was an increase of that amount from no trade whatever during September, and came exclusively from the Netherlands. Of the galvanized after weaving grade, 1,507,485 square feet were imported from Belgium, 1,051,360 square feet, and the Netherlands, 456,125 square feet. This total compared with 1,402,450 square feet received during the earlier month.

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With
FLYING SHEAR
for round and shaped wire.

✦ ✦ ✦

THE HALLDEN MACHINE COMPANY
THOMASTON CONNECTICUT

✦ ✦ ✦

EXPORTS of iron and steel wood screws during October, 1935 totaled 36,541 gross valued at $4,277. Of this total the Union of South Africa took 15,700 gross valued at $1,398; United Kingdom 6,127 gross valued at $988; Cuba 3,905 gross valued at $461; Mozambique 2,670 gross valued at $288; Mexico 1,772 gross valued at $215; Salvador 1,655 gross valued at $154; Dominican Republic 1,159 gross valued at $151.

✦ ✦ ✦

EXPORTS of brass wood screws during the same period totaled 2,961 gross valued at $1,085. Of this amount Venezuela took 770 gross valued at $210; Mexico 489 gross valued at $174; Cuba 476 gross valued at $152; Brazil 260 gross valued at $74; Canada 252 gross valued at $305.

✦ ✦ ✦

IMPORTS of wood screws during the same period amounted to 7,256 gross valued at $1,494 of which Sweden supplied 7,230 gross, valued at $1,430.

✦ ✦ ✦

Salem Engineering Company Moves

SALEM **Engineering Company** announces removal of their offices and works of the Subsidiary company, Salem Engineering Company of Canada from Toronto, Ontario, to Welland, Ontario.

✦ ✦ ✦

THE company has acquired manufacturing facilities at Welland and intends carrying on the manufacture of a full line of electrically heated and fuel fired industrial furnaces. Mr. A. T. Greiner is resident manager.

✦ ✦ ✦

SALEM Engineering Company of Canada is a wholly owned subsidiary of Salem Enginering Company at Salem, Ohio, a co-partnership formed by Sam Keener and M. H. Mawhinney.

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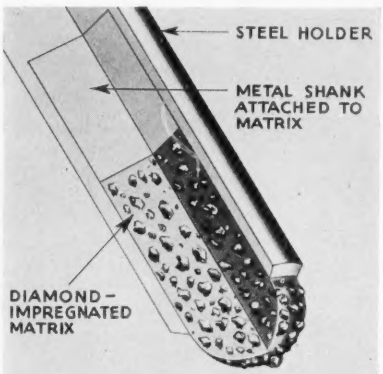
Carboloy Announces New Wheel Dresser

CARBOLOY Company, Incorporated, Detroit, Michigan, manufacturers of Carboloy Cemented Carbide products, announce the release of an additional grade of their diamond impregnated wheel dresser. The new grade contains an extra coarse mesh of diamonds and has been developed to increase the order of performance on the larger and harder grades of grinding wheels used on surface, cylindrical and centerless grinders.



CARBOLOY DIAMOND-IMPREGNATED DRESSER

This extra coarse grade supplements the existing grades of Carboloy dressers containing fine, medium and coarse mesh size diamonds. With this development, this dresser can now be used on all hardnesses and sizes of grinding wheels.

✦ ✦ ✦

ADVANTAGES claimed for this diamond impregnated wheel dresser, as described by the manufacturer, are that no remountings are required, they stand unusual abuse, and each dresser may be used throughout its entire life on the same sized wheel.

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For Wire, Rod and Tubing
Round and Special Shapes
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Index to Advertisers

A

American Chemical Paint Co. 52
American Insulating Machinery Company 49
American Lanolin Corp. 50
American Lime & Stone Co. 47
American Machine and Foundry Co. 13

B

Balloffet Diamond Wire Dies Co., Inc. 53
Bethlehem Steel Company 44
Bissett Steel Company, The 53
Broden Construction Co. 53

C

Carboloy Company, Inc. 1
Cleveland Electric Tramrail Division of Cleveland Crane & Engineering Co. 7
Cochaud Wire Die Corp. 53
Continental Steel Corp. 43

D

Davis Electric Co., R. L. 48
Delaney Chemical Co. 47
Driver-Harris Co. 51
Dunscomb Associates 8
Durant Manufacturing Co. 49
Duriron Company, Inc., The 46

E

Electric Furnace Co., The ..... Back Cover

F

Firth-Sterling Steel Company 14

G

Glader Machine Works, Wm. 37

H

Hallden Machine Company, The 52
Hudson Wire Company 4

K

Kelly Wire Die Corp. 53
Keystone Steel & Wire Co. 40

L

Laclede Steel Company 39
Lancaster, Allwine & Rommel 50
Lewis, Kenneth B. 53

M

Master Wire Die Corp. 11
Micro Products Company 33
Miller Co., Inc., R. H. 50
Morgan Construction Co. 9
Morrison Engineering Co., Inc. 35

N

New Products Development Corp. 53
Norton Company 2

P

Parkin Co., Wm. M., The 52
Platt Bros. & Co., The 53
Pittsburgh Steel Co. 10
Polk & Co., R. L. 52

R

Republic Steel Corporation 5
Robertson Co., Inc., John 45
Robertson & Co., Inc., J. T., The 50
Ruesch Machine Company, H. J. 53

S

Saylor, F. D. & Son 38
Schuyler, W. A. 53
Scott Company, Henry L., ... 41
Scudder Foundry & Machine Co., E. J. 53
Shuster Co., F. B., The 52
Sleeper & Hartley, Inc. 49
Spowers, W. H. Jr. 53
Surface Combustion Corporation 42
Syncro Machine Company 36

T

Thomson-Judd Wire Machinery Co. 53
Twitchell, E. W., Inc. 53

U

Union Wire Die Corp. 12

V

Vaughn Machinery Co., The ..... Front Cover
Vianney Wire Die Works 46

W

Waterbury Farrel Foundry & Machine Company 6
Watson Machine Company, The ..... Third Cover
Wheeling Steel Corp. 3

Y

Youngstown Sheet & Tube Co., The ..... Inside Front Cover

✦ ✦ ✦

Requirements of Materials For Weaving Fourdrinier Wires

(*Continued from page 18*)

50 degrees steps over a range of from 1000 to 1550 deg. F.

✦ ✦ ✦

FIG. 4 illustrates the grain formation of two fourdrinier wires sent in after removal from the fourdrinier machines. One of these was eminently successful while the other gave very poor service. A study of the grain sizes shows quite a marked difference between these two wires and as they were of identical chemical analysis it is reasonable to believe that by an adjustment of the grain size in both the warp and shoot the wire shown on the left could be expected to give a better run.

✦ ✦ ✦

IT is evident that in the future the manufacturer of paper machine wires will be expected to more nearly meet the specialized requirements of individual types of fourdrinier machines or even to go so far as to produce wire in suitable condition for running on a particular machine. This will result in longer life of the wires and will be made possible only through very close cooperation of the user with the manufacturer. The development of this important phase of the wire cloth business must keep pace with the changing influences demanded by higher fourdrinier speeds and the higher strain brought about by the modern paper mill equipment.

✦ ✦ ✦

PROCEEDINGS AND DISCUSSIONS of the 1935 WIRE ASSOCIATION MEETINGS
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DIES—Tungsten Carbide
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Platt Bros. & Co., The, Waterbury, Conn.

FILLERS—Paper for Cable
E. W. Twitchell, Inc., Phila., Pa.

FURNACES—Annealing
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

FURNACES—Automatic
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

FURNACES—Electric
Electric Furnace Co., Salem, O.

FURNACES—Lead Melting
Electric Furnace Co., Salem, O.
John Robertson Co., Brooklyn, N. Y.
Surface Combustion Co., Toledo, O.

FURNACES—Non-Oxidizing
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

FURNACES—Wire, Strip and Sheet
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

GRINDERS—Roll
Norton Co., Worcester, Mass.

HANDLING EQUIPMENT—Material
Cleveland Electric Tramrail, Div. of Cleveland Crane & Eng. Co., Wickliffe, O.

INHIBITORS
American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelphia, Pa.
Parkin Co., The Wm., Pittsburgh, Pa.

INSULATION—Cable or Cable Filler
E. W. Twitchell, Inc., Phila., Pa.

LATHES—Die Reaming
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

LIME—Pulverized
Amer. Lime & Stone Co., Bellefonte, Pa.

LUBRICANTS—Wire Drawing
American Machine & Foundry Co., Amaloy Div., Brooklyn, N. Y.
R. H. Miller Co., Homer, N. Y.
J. T. Robertson & Co., Syracuse, N. Y.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
John Robertson Co., Brooklyn, N. Y.
Saylor, F. D. & Son, Detroit, Mich.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
New England Butt Co., Providence, R. I.
Saylor, F. D. & Son, Detroit, Mich.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Bunching
Amer. Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Machinery Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Company. Paterson, N. J.

MACHINERY—Chain Making
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Coilers
Broden Const. Co., Cleveland, O.
Morgan Const. Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Copper Wire Drawing and Rolling
H. J. Ruesch Machine Co., Newark, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Covering Wire—
Saylor, F. D. & Son, Detroit, Mich.
Syncro Machine Co., Newark, N. J.

MACHINERY—Cutting
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
F. B. Shuster Co., New Haven, Conn.
W. A. Schuyler, New York, N. Y.
Sleeper & Hartley, Worcester, Mass.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Extruding
John Robertson Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Forming
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Gang Winders
H. J. Ruesch Machine Co., Newark, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
American Insulating Machinery Co., Phila.
New England Butt Co., Providence, R. I.
Saylor, F. D. & Son, Detroit, Mich.
Syncro Machine Co., Newark, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, etc.
John Robertson Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
John Robertson Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Material Handling
Cleveland Electric Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MACHINERY—Measuring Wire & Cable
Davis Electric Corp., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis., and Providence, R. I.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader Mfg. Co., Chicago, Ill.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Machinery Co., Phila.

MACHINERY—Pointing
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

BUYERS' GUIDE, Continued

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, O.
Morgan Const. Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
W. A. Schuyler, New York, N. Y.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rubber Strip Covering
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila. Pa.
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry and Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Special—Combination Machine for Drawing, Cutting-to-length, Straightening and Reeling Bars from Coil in One Operation (Shumag Type)—
W. A. Schuyler, New York, N. Y.

MACHINERY—Spooling
American Insulating Machinery Co., Phila.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
H. J. Ruesch Machine Co., Newark, N. J.
W. A. Schuyler, New York, N. Y.
F. B. Shuster, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Const. Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Swaging
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Worcester, Mass.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Taping
Amer. Insulating Mach. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing Size of Wire
R. L. Davis Elec. Co., Wallingford, Conn.

MACHINERY—Testing Wire
Henry L. Scott Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
Amer. Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Welding Wire
Micro Products Co., Chicago, Ill.
F. B. Shuster Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Insulating Machinery Co., Phila.
Broden Const. Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
W. A. Schuyler, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Company, Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Wrapping Wire
W. A. Schuyler, New York, N. Y.

MATERIAL HANDLING EQUIPMENT—
Cleveland Electric Tramrail Div., of Cleveland Crane & Eng. Co., Cleveland, O.

PAPER—Insulating
E. W. Twitchell, Inc., Phila., Pa.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelphia, Pa.
Parkin Co., The Wm., Pittsburgh, Pa.

POTS—Lead Melting
John Robertson Co., Brooklyn, N. Y.

PRESSES—Hydraulic and Mechanical
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead
John Robertson Co., Brooklyn, N. Y.

PULLERS—Wire
E. J. Scudder Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
John Robertson Co., Brooklyn, N. Y.

REEL AND TENSION STAND—
Sleeper & Hartley, Inc., Worcester, Mass.

REEL CRUTCHES
Watson Machine Co., Paterson, N. J.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Morrison Engineering Co., Cleveland, O.

RODS—Wire—Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Laclede Steel Co., St. Louis, Mo.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

RUST PROOF COMPOUND
American Lanolin Co., Lawrence, Mass.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Republic Steel Co., Youngstown, O.
Superior Sheet Steel Co., Canton, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SOAPS—Wire Drawing
R. H. Miller Co., Homer, N. Y.
J. T. Robertson & Co., Syracuse, N. Y.

STRIP—Brass, Zinc and Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Laclede Steel Co., St. Louis, Mo.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TESTERS—Wire
Henry L. Scott Co., Providence, R. I.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS
H. J. Ruesch Machine Co., Newark, N. J.

VALVES AND FITTINGS—Acid Proof
Duriron Co., The, Dayton, O.

VULCANIZERS
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS
American Insulating Mach'y Co., Phila., Pa.

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Laclede Steel Co., St. Louis, Mo.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Corp., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.

WIRE—Enameled For Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Co., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Laclede Steel Co., St. Louis, Mo.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, Ohio

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Company, Ossining, N. Y.

WIRE—Non Ferrous to Specification For Special Purposes
Hudson Wire Co., Ossining, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel and Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Laclede Steel Co., St. Louis, Mo.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE AND STRIP—Brass, Zinc
Platt Bros. & Co., The, Waterbury, Conn.

This is a carefully classified index of concerns who specialize in this industry and who advertise regularly in WIRE & WIRE PRODUCTS. Please mention WIRE when writing to these firms.

THE WATSON MACHINE COMPANY

ESTABLISHED 1845

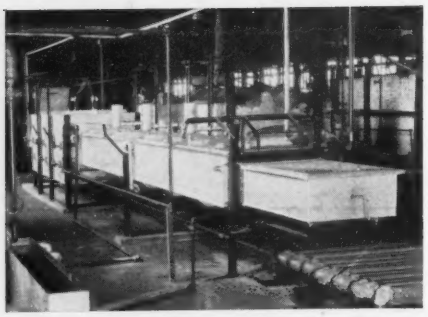
PATERSON, NEW JERSEY, U. S. A.

Electric Cable and Wire Rope Machinery:

STRANDERS	Planetary & Rigid Frame types (*horizontal and vertical.*) High-Speed Tubular and Built-up types.
BUNCHERS	High-speed types for spools up to 1500 lb. capacity.
ARMORING MACHINES	For Wire (*planetary type*) and for Tape.
PAIRING & TRIPLING MACHINES	For Bare & Insulated Wire.
CLOSERS	For Wire in Planetary, High-speed & Angular types.
CLOSERS & CABLERS	For electric cable in Planetary and Angular types.
TAPING MACHINES	Eccentric and Concentric types, for Paper, Friction and Varnished Cambric and Burlap types.
TAPING HEADS	For applying steel tape in Eccentric and Concentric high-speed types.
JUTE & BURLAP	Applying Heads.
THREAD SERVERS	For Cotton, Asbestos, etc. application on hose and wire.
COMPOUND TANKS	Electrical or Steam heated for machine or unit application.
CHALK APPLIERS	Wet and Dry types.
CAPSTAN SECTIONS	With Single tapered and double grooved wheels, with Lay Control by gears or variable speed transmission.
LET OFF REEL STANDS	Shaft and Shaftless types, for any size of reels.
WINDERS	For steel and copper, in single or multiple head units.
COILING MACHINES	Power or manual drive for package coiling—also for warehouse and shipping room use.
COILING HEADS	For wire rope and insulated wire and cable.
TAKEUP STANDS	Inclined frame, Shaftless and Heavy-duty types.
TRAVERSES	Light and Heavy, manual, mechanical and motorized.
TEMPERING & GALVANIZING MULTIPLE HEAD TAKEUPS	For wire.
MEASURING MACHINES	For Length Measurement.
ELECTRIC PATCH VULCANIZERS	
SATURATING, WAXING & GREASING TANKS	Gas fired and Electrical.
WIRE TINNING MACHINES	Gas fired and Electrical.
CABLE PEELERS	For removing lead sheathing and insulation.
POLISHING HEADS	Separately or Motor driven.
REEL CRUTCHES	For turning heavy reels in handling and shipment.
MOTORIZED WINCHES	For general duty in cable and rope plants.
CUTTERS	For wire rope, cable and chain.
SPOOLS	Heavy-duty for Rope-Mills and Cable-plants.

Send for descriptive catalogue.

ELECTRICAL WIRE AND CABLE—WIRE ROPE AND CORDAGE MACHINERY

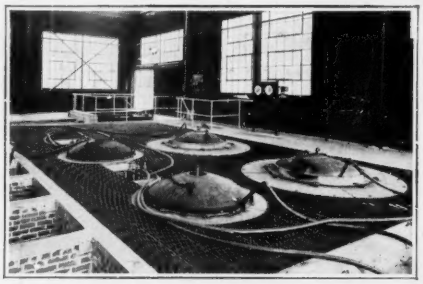


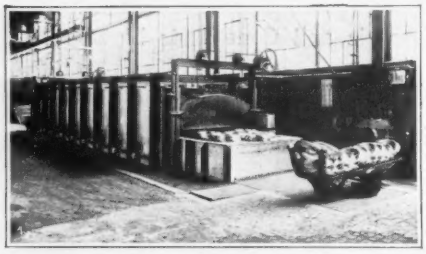
Bright Annealing Copper Wire

The illustration at left shows a continuous controlled atmosphere furnace installation for bright annealing fine copper wire on spools—no vapor or water seal is used in this equipment—the wire comes out uniformly annealed bright and dry, ready for shipment or further processing. Other outstanding installations have been made for bright and clean annealing ferrous and non-ferrous wire, stampings, strip and tubing in coils and straight lengths.

Bright Annealing Steel Wire

The illustration at right shows two pit type furnaces with Elfurno gas generator for annealing steel wire in coils. Advantages include: increased tonnage per pit, improved fuel economy, more uniformly annealed wire, lower maintenance cost, decreased annealing time and labor requirements, and maximum flexibility—will produce bright surface, semi-bright or otherwise as required.



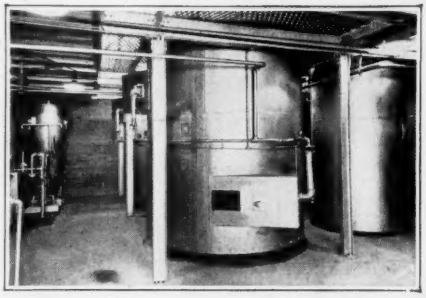


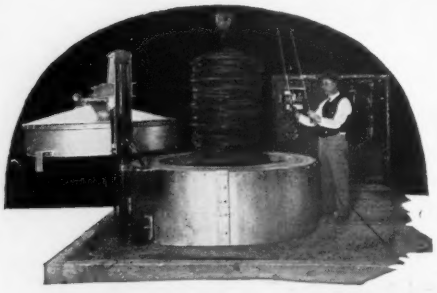
Clean Annealing Brass Wire

The continuous, gas-fired, controlled atmosphere furnace shown at left was built for a prominent brass and copper company for clean annealing brass and bronze wire in coils. The wire is carried through on a series of continuous alloy chains spaced to carry both small and large coils. The furnace handles 5000 lbs. per hour, and according to the purchaser "produces a high quality, low cost anneal with very good finish".

Normalizing and Spheroidizing Rod

Fuel fired pit furnaces of the type shown at right and above have also been developed for clean normalizing and spheroidizing rod as well as the annealing of low carbon steel wire in coils. Low operating and maintenance cost, greater uniformity and ease of handling are some of the advantages of these fuel fired pits—they can be either gas or oil fired.





Annealing High Carbon Rod

The illustration at left shows one unit of an installation of electrically heated circular pit type furnaces installed in a prominent steel plant for annealing high carbon and alloy steel wire rod in coils without scale or decarburization. This is one of several similar installations we have made for this process. Additional information on any of these installations will be sent on request.

We specialize on building electric and fuel-fired equipment to fit the customer's specific requirements—for any heating or heat treating process—for any product or production. No job is too large or unusual. We solicit your inquiries.

THE ELECTRIC FURNACE CO.

SALEM, OHIO.

Fuel Fired Furnaces

Electric Furnaces